

JSS Academy of Higher Education and Research

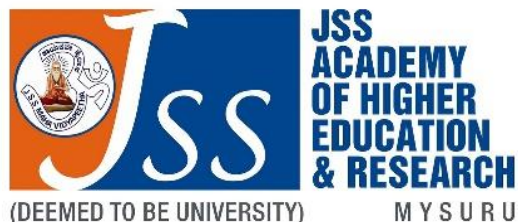
## JSS College of Pharmacy

Sri Shivarathreshwara Nagara, Mysuru-570015

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*An ISO 9001:2015 Certified Institution*



### III<sup>rd</sup> Pharm D Course Handout 2020-21



Accredited 'A+'  
Grade by  
NAAC



1<sup>st</sup> in Karnataka  
& 3<sup>rd</sup> in INDIA to  
be rated with 4  
stars



Ranked 1<sup>st</sup> among  
the YOUNG  
UNIVERSITIES in  
Karnataka



JSS College of  
Pharmacy,  
Mysuru - 10<sup>th</sup>  
Rank in INDIA  
2020



INTERNATIONAL  
CERTIFICATION  
Pharm D Program is  
Certified by Accreditation  
Council for Pharmacy  
Education (ACPE), USA



ARIIA  
ATAL RANKING OF INSTITUTIONS  
ON INNOVATION ACHIEVEMENTS

Ranked 4<sup>th</sup> in India for 2019

## Academic Calendar 2020-2021

### (III Pharm.D.)

#### Teacher's Incharge

Class	Class Teacher	Batch No.	Batch Teacher
III Pharm.D.	Dr. R.S. Chandan	I	Dr. K.L. Krishna
		II	Dr. Balaji

### ACTIVITIES AND COORDINATORS 2020-21

#### Curricular & Co curricular activities

Sl. No	Activities	Coordinator/s
1.	Induction, learning skills and personality development programs for fresher's	DHP/MPG
2.	Selection of class representative in first week of commencement of each course	
3.	Anti ragging cell	HP/ BM
4.	Grievance and redressal cell	PKK
5.	Industrial Visits, Training and placements	TS/ABP
6.	Guest lectures & Seminars/ conferences/ training / workshop <ul style="list-style-type: none"><li>• organized at college</li><li>• delivered/attended by staff</li></ul>	Respective department all HODs
7.	Internal Assessment Committee Chairperson Members	GVP RSS/SNM/DAT/BMV
8.	<ul style="list-style-type: none"><li>• Academic Council Board</li><li>• Identification of Advanced/ Medium/ Slow learners</li></ul>	Class Teachers Subject Teachers
9.	Ethics committee Meeting <ul style="list-style-type: none"><li>• Animal</li><li>• Human</li></ul>	KLK MR
10.	Time table	DHP TS/ URR/ VR/AMM/HYK
11.	Internal Quality Assurance Cell Chairperson Members	PKK/ AMM/AKT/HVG/SP
12.	Women's cell (Prevention of Sexual Harassment Cell)	SNM
13.	Scholarship Bureau	RSC

14.	Compilation of publications (Research papers/books/chapters)	BMG
15.	Research Coordination Committee -Compilation of Ph.D details and funded projects - Plagiarism - Review of publications	Chairperson – DVG Members – BRP/SB/JS
16.	Pharmacy Education Unit (CCLPE)	PKK/KU/RSS
17.	Annual result analysis List of merit students	UG – Subject Teacher, Class teacher & Program committee PG – Course Coordinator & Abhishek (Office)
18.	GPAT and other competitive exams (TOEFL, GRE etc.)	BM/ CSH/MPG
19.	Library orientation	Librarian
20.	Soft Skills Training	ABP

### Extracurricular activities

Sl. No.	Activities	Coordinator/s
21.	<ul style="list-style-type: none"> <li>• Selection of Class Representatives, Pharmaceutical society members</li> <li>• Annual planning and execution of Student centered and professional activities including inauguration of IPS</li> </ul>	MSS/ SRD
22.	JASPHARM	BS/ SM / CSH
23.	STUMAG	HYK
24.	Sports coordinators	MPV/HKS
25.	NSS coordinators	MPG / UM/ SND
26.	Cultural & Literary coordinators	KNS/CI

### Other Institutional activities

Sl. No.	Activities	Coordinator/s
27.	Annual Day celebration / Graduation day	DAT/SM
28.	Course handouts/ Teachers diary/ Student handbook/Faculty handbook	HYK/PS
29.	National Pharmacy Week (NPW) & Pharmacists	VJ/ UM + IPA team

	Day	
30.	Alumni association	HVG/ AKT/SM/BS
31.	Herbal and College Garden	JS/ NPK/VR
32.	ISO	DHP/SNM
33.	Press and publicity	KLK /BMV/OFFICE
34.	Foreign students cell	MPV
35.	Governing council meeting	JUS/ Office
36.	Monthly/Annual report of college activities to JSS AHER and other agencies	HoDs/JUS/ST/AKT/AM/KU/NPK Asha (office)
37.	College website	HKS/KU
38.	Research & Consultancy Co-ordinator • Collaboration with Industries/organizations • Interdepartment/Interdisciplinary research	DVG/ SB/ KM
39.	Coordinator - JSSUonline.com	ABP/TS
40.	JSSU Newsletter	KLK SRD/ KNS
41.	Annual group photo session	MSS/ SRD
42.	Lab coat and Blazers	JS / Ningaraju
43.	Notice Board (SNB, LNB and IIPC), Departmental staff list	Nagaraju
44.	Stock verification	Office staff /Librarian
45.	Student Liaison	Divya S
46.	Student ID Cards /Attendance entry	Shivanna / Manjunath
47.	Retreat for Pharmacy Students	AKT/ HKS/BRJ
48.	Feedback	VJ
49.	Institute Innovation Cell	HVG/PKK
50.	Practice School	MPG/VJ

### Program Committee

Sl. No.	Program committees	Chairperson	Member Secretary
51.	D.Pharm	PKK	BMV
52.	B.Pharm	PKK	DAT
53.	Pharm.D	MR	RSS
54.	M.Pharm	PKK	SNM
55.	B.Pharm – Practice	MR	BRJ
56.	PG Diploma	PKK	JS

### M.Pharm Program Coordinators

Sl.	M.Pharm Program	Coordinator
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No.		
57.	Pharmaceutics	VJ
58.	Industrial Pharmacy	ABP
59.	Pharmaceutical Regulatory Affairs	MPV
60.	Pharmaceutical Quality Assurance	HVG
61.	Pharmaceutical Chemistry	BRP
62.	Pharmaceutical Analysis	BMG
63.	Pharmacology	KLK
64.	Pharmacognosy	NPK
65.	Pharmacy Practice	SP

### PG Diploma Program Coordinators

Sl. No.	PG Diploma Program	Coordinator
66.	Pharmacovigilance	CSH
67.	Medicine & Poison Information	RSS
68.	Clinical Research	JUS
69.	Nanotechnology	VJ
70.	Pharmaceutical Quality Assurance	HVG
71.	Pharmaceutical Regulatory Affairs	MPV
72.	Medical Devices	BMV
73.	Intellectual Property Rights	BMV
74.	Computer Aided Drug Design	DAT
75.	Food and Drug Analysis	RSC
76.	Regulatory Toxicology	SB
77.	Phytopharmaceutical and Industrial Applications	JS

### Certificate Course Coordinators

Sl. No.	Certificate Course	Coordinator
78.	Pharmaceutical Quality Assurance	HVG
79.	Herbal Drug Standardization	JS
80.	Medicine Information	RSS

## TEACHING STAFF LIST

Sl. No	NAME	QUALIFICATION	DESIGNATION	Department
1	Dr. T.M. Pramod Kumar (TMP)	M.Pharm., Ph.D.	Professor & Principal	Pharmaceutics
2	Dr. P.K. Kulkarni (PKK)	M.Pharm., Ph.D.	Professor & Vice Principal	Pharmaceutics
3	Dr. D. Vishakante Gowda (DVG)	M.Pharm., Ph.D.	Professor & Head	Pharmaceutics
4	Dr. Balamuralidhara V. (BMV)	M.Pharm., Ph.D.	Asst. Professor	Pharmaceutics
5	Dr. Gangadharappa H.V.(HVG)	M.Pharm., Ph.D.	Asst. Professor	Pharmaceutics
6	Dr. M.P. Venkatesh (MPV)	M.Pharm., Ph.D.	Asst. Professor	Pharmaceutics
7	Dr. Vikas Jain (VJ)	M.Pharm., Ph.D.	Asst. Professor	Pharmaceutics
8	Dr. Amit B Patil (ABP)	M.Pharm., Ph.D.	Asst. Professor	Pharmaceutics
9	Dr. Gowrav M P (MPG)	M.Pharm., Ph.D.	Lecturer	Pharmaceutics
10	Mr. Hemanth Kumar S (HKS)	M.Pharm	Lecturer	Pharmaceutics
11	Mrs. Asha Spandana K M (ASP)	M.Pharm	Lecturer	Pharmaceutics
12	Mr B Mahendran (BM)	M.Pharm	Lecturer	Pharmaceutics
13	Dr Shailesh T (TS)	M.Pharm., Ph.D.	Lecturer	Pharmaceutics
14	Smt Preethi S (PS)	M.Pharm	Lecturer	Pharmaceutics
15	Dr. M. Ramesh (MR)	M.Pharm., Ph.D.	Professor & Head	Pharmacy Practice
16	Mr. D.H. P. Gowda (DHP)	M.Sc., PGDCA.	Asst. Professor	Pharmacy Practice
17	Mrs. Shilpa Palaksha (SP)	M.Pharm.	Asst. Professor	Pharmacy Practice
18	Mrs. Savitha R S (RSS)	M.Pharm.	Asst. Professor	Pharmacy Practice
19	Mr. Jaidev Kumar B R (BRJ)	M.Pharm.	Lecturer	Pharmacy Practice
20	Dr. M Umesh (UM)	Pharm D.	Lecturer	Pharmacy Practice
21	Dr. Juny Sebastian (JUS)	M.Pharm., Ph.D.	Lecturer	Pharmacy Practice
22	Dr Sri Harsha Chalasani (CSH)	M.Pharm., Ph.D.	Lecturer	Pharmacy Practice
23	Dr. Krishna Undela (KU)	M.Pharm., Ph.D.	Lecturer	Pharmacy Practice
24	Dr Srikanth M S (MSS)	M.Pharm., Ph.D.	Lecturer	Pharmacy Practice
25	Mr Balaji S (BS)	M.Pharm	Lecturer	Pharmacy Practice
26	Dr U R Rakshith (URR)	Pharm D	Lecturer	Pharmacy Practice
27	Dr. B.M. Gurupadayya (BMG)	M.Pharm., Ph.D.	Professor	Pharma. Chemistry
28	Dr. Gurubasavaraj V Pujar (GVP)	M.Pharm., Ph.D.	Professor & Head	Pharma. Chemistry
29	Dr. Prashantha Kumar B R (BRP)	M.Pharm., Ph.D.	Asst. Professor	Pharma. Chemistry
30	Dr. R. S. Chandan (RSC)	M.Pharm., Ph.D.	Asst. Professor	Pharma. Chemistry
31	Dr. Anand Kumar Tengli (AKT)	M.Pharm., Ph.D.	Asst. Professor	Pharma. Chemistry
32	Dr. Durai Ananda Kumar (DAT)	M.Pharm., Ph.D.	Asst. Professor	Pharma. Chemistry

33	Dr. Jaishree V (JV)	M.Pharm., Ph.D.	Asst. Professor	Pharma. Chemistry
34	Dr. H. Yogish Kumar (HYK)	M.Pharm., Ph.D.	Lecturer	Pharma. Chemistry
35	Dr. Sheshagiri Dixit (SRD)	M.Pharm., Ph.D.	Lecturer	Pharma. Chemistry
36	Mr. Chetan.IA	M.Pharm	Lecturer	Pharma. Chemistry
37	Dr. K Mruthunjaya (KM)	M.Pharm., Ph.D.	Professor & Head	Pharmacognosy
38	Dr. J. Suresh (JS)	M.Pharm., Ph.D.	Professor	Pharmacognosy
39	Dr. N Paramakrishnan (NPK)	M.Pharm., Ph.D.	Lecturer	Pharmacognosy
40	Mr. Vageesh Revadigar (VR)	M.Pharm	Lecturer	Pharmacognosy
41	Ms. Haripriya G	M Pharm	Lecturer	Pharmacognosy
42	Dr. S. N. Manjula (SNM)	M.Pharm., Ph.D.	Professor & Head	Pharmacology
43	Dr. Saravana Babu C (SB)	M.Pharm., Ph.D.	Asso.Professor	Pharmacology
44	Dr. K L Krishna (KLK)	M.Pharm., Ph.D.	Asst. Professor	Pharmacology
45	Mrs. A M Mahalakshmi (AMM)	M.Pharm.	Lecturer	Pharmacology
46	Mrs. Seema Mehdi (SM)	M.Pharm	Lecturer	Pharmacology
47	Dr. Nagashree K S (KNS)	M.Pharm., Ph.D	Lecturer	Pharmacology

## **PHARM.D**

### **Expected Competencies and outcomes:**

1. Development of knowledge and skills
2. Assessment of patient medical condition
3. Development of pharmaceutical care plan
4. Management of patient medication therapy
5. Pharmacotherapeutic decision-making skills
6. Hospital pharmacy management
7. Promote public health care program
8. Ethics and professionalism
9. Analytical thinking and interpretational skills
10. Communication skills
11. Management skills
12. Design and conduct of need based research projects
13. Life-long learning



**COURSE HANDOUT 2020-21****Class: III Pharm. D.****I Course Details**

S.No.	Name of Subject	No. of hours of Theory	No. of hours of Practical	No. of hours of Tutorial
(1)	(2)	(3)	(4)	(5)
3.1	Pharmacology-II	3	3	1
3.2	Pharmaceutical Analysis	3	3	1
3.3	Pharmacotherapeutics-II	3	3	1
3.4	Pharmaceutical Jurisprudence	2	-	-
3.5	Medicinal Chemistry	3	3	1
3.6	Pharmaceutical Formulations	2	3	1
<b>Total hours</b>		<b>16</b>	<b>15</b>	<b>5</b>
<b>Grand Total</b>		<b>36 hrs/ week</b>		

**2. Evaluation:**

**Theory:** Internal assessment Marks: 30. Three periodic theory sessional examinations will be conducted in theory for 30 marks (*duration 1.5 Hour*) and average of best two will be considered for evaluation.

**Practical:** Internal assessment Marks: 30. Three periodic practical sessional examinations will be conducted for 20 marks and average of best two will be considered for evaluation, plus 10 marks are awarded for regularity, promptness, viva-voce and record maintenance. JSS University will conduct annual examination for 70 marks in theory & practical at end of the academic session.

Classes will be awarded on the basis of total (sessional and annual examination) marks secured.

Class	Marks
Distinction	75% and above
First class	60% and above and less than 75%
Second class	50% and above and less than 60%
Pass class	Passed examination in more than one attempt.

**3 Sessional Examination schedule:** I, II and III sessional dates will be announced separately.

**4 Attendance:** Minimum of 80% attendance is necessary to appear for both Sessional and Annual examination.

**5 Chamber consultation hours:** Any time during College hours.

**6 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.

### 3.1 PHARMACOLOGY–II (THEORY)

**Theory: 3 Hrs. /Week**

**Responsible member/s of the academic staff: Dr. K. L. Krishna (KLK)**

**Scope and Objectives:** This subject will provide an opportunity for the student to learn about the drug with regard to classification, pharmacodynamic and pharmacokinetic aspects, adverse effects, uses, dose, route of administration, precautions, contraindications and interaction with other drugs. In this subject, drugs acting on autacoids, respiratory system, GIT, immune system, hormones, pharmacology of autacoids and different aspects of genes will be concentrated. In addition, pharmacology of chemotherapeutic agents and principles of toxicology are also taught. In addition to theoretical knowledge, the basic practical knowledge relevant to therapeutics will be imparted.

**At completion of this course it is expected that students will be able to:  
(Student learning outcomes)**

**Theory:**

1. Define and classify the drugs used for systemic and infectious diseases.
2. Explain the mechanism of action, pharmacological actions, drug interactions and contraindication of various class drugs.
3. List the clinical uses and adverse effects of different classes of drugs and apply their knowledge therapeutically.
4. Describe the gene therapy techniques and their applications.
5. Explain the importance of biotechnological techniques and their principles employed in drug discovery and development process.

**Practical:**

1. Explain the importance of preclinical animal studies in drug discovery process.
2. Define DRC and explain the properties of DRC.
3. Explain the procedure of recording DRC of agonists using tissue preparations.
4. Perform various bioassay methods employing simulated software.
5. Perform various *in-vivo* pharmacological experiments by using simulated software and interpret the result obtained.

**Teaching/learning methodologies used:**

1. Lecture
2. Practical/Lab

**Course materials:**

#### TEXT BOOKS

1. Tripathi, K. D. Essentials of medical pharmacology. 6<sup>th</sup> edition, 2008. Publisher: Jaypee, Delhi.
2. Satoskar, R.S. and Bhadarkar, S.D. Pharmacology and pharmacotherapeutics. 20<sup>th</sup> edition (single volume), 2008. Publisher: Popular, Mumbai.

3. Rang, H.P. and Dale, M.M. Pharmacology. 5<sup>th</sup> edition, 2003. Publisher: Churchill Living stone.
4. Alberts, B., Bray, D., Lewis, J., Raff M., Roberts, K and Watson, JD Molecular Biology of the Cell by, 5<sup>rd</sup> edition, 2008, Publisher: Garland Science.

### REFERENCE BOOKS

1. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P. Goodman and Gilman's The pharmacological basis of therapeutics. 11<sup>th</sup> edition, 2006. Publisher: McGraw Hill, Pergamon press.
2. Craig, C.R. and Stitzel, R.E. Modern Pharmacology. 5<sup>th</sup> edition 1997. Publisher: Little Brown and company.
3. Katzung, B.G. Basic and clinical pharmacology. 9<sup>th</sup> edition 2004. Publisher: Prentice Hall, International.
4. Gupta, P.K. and Salunkhe, D.K. Modern Toxicology. Volume I, II and III. 1985. Publisher: B.V. Gupta, Metropolitan Book Co. (p) Ltd, New Delhi.
5. Crommelin, DJA and Sindelar RD. Pharmaceutical Biotechnology. 3<sup>rd</sup> edition 2008. Publisher: Infarma Healthcare.
6. Watson, JD., Gilman, M., et al. Recombinant DNA. 2<sup>nd</sup> edition 1992. Publisher: Scientific America.
7. Walsh, G. Biopharmaceutical: Biochemistry and Biotechnology. 2<sup>nd</sup> edition 2007. Publisher: John Wily.
8. Derelanko MG. Handbook of toxicology. 2<sup>nd</sup> edition 2002; Publisher: CRC Press.

### Lecture wise Programme

Topic	Hrs
<b>Pharmacology of drugs acting on Blood and blood forming agents</b>	<b>06</b>
a) Anticoagulants	
b) Thrombolytics and antiplatelet agents	
c) Haemopoietics and plasma expanders	
<b>Pharmacology of drugs acting on Renal System</b>	<b>03</b>
a) Diuretics	
b) Antidiuretics	
<b>Pharmacology of drugs acting on Gastrointestinal Tract</b>	<b>06</b>
a) Antiulcer drugs, Antacids	
b) Laxatives and purgatives	
c) Emetics and antiemetics	
d) Appetizers, digestants and carminatives	
<b>Chemotherapy</b>	<b>22</b>
a) Introduction	
b) Sulfonamides and co-trimoxazole	
c) Penicillins and Cephalosporins	
d) Tetracyclins and Chloramphenicol	
e) Macrolides, Aminoglycosides, Polyene & Polypeptide antibiotics	
f) Quinolines and Fluroquinolines	
g) Antifungal antibiotics	
h) Antiviral agents	
i) Chemotherapy of tuberculosis and leprosy	

- j) Chemotherapy of Malaria
- k) Chemotherapy of protozoal infections (amoebiasis, giardiasis)
- l) Pharmacology of Anthelmintic drug
- m) Chemotherapy of cancer (Neoplasms)

**Immunopharmacology** **03**

Pharmacology of immunosuppressants and stimulants

**Principles of Animal toxicology** **02**

- a) Acute, subacute and chronic toxicity.
- b) Principles involved in the various toxicity screening methods available for drugs in the laboratory animals.

**The dynamic cell: The structures and functions of the components of the cell** **11**

- a) Cell and macromolecules: Cellular classification, sub-cellular organelles, macromolecules, large macromolecular assemblies
- b) Chromosome structure: Pro and eukaryotic chromosome structures, chromatin structure, genome complexity, the flow of genetic information.
- c) DNA replication: General, bacterial and eukaryotic DNA replication.
- d) The cell cycle: Restriction point, cell cycle regulators and modifiers.
- e) Cell signaling: Communication between cells and their environment, ion-channels, signal transduction pathways (MAP kinase, P38 kinase, JNK, Ras and PI3-kinase pathways, biosensors.

**The Gene: Genome structure and function:** **18**

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

**Bio-assay methods** **4**

Scope, principles involved in general methods, bioassay designing, applications and limitations

**Theory Sessional examination syllabus**

Sessional No.	Syllabus
	Chapters no.
I	1, 2, 3, 5, 6, 9
II	4, 7a, 7b
III	7c to 7e, 8

### 3.1 PHARMACOLOGY – II (PRACTICALS)

**Theory: 75 Hours (3 Hrs/ Week)**

**Responsible member/s of the academic staff: Dr. K. L. Krishna (KLK)**

**List of Experiments:**

1. Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).
2. Study of physiological salt solutions used in experimental pharmacology.
3. Study of laboratory appliances used in experimental pharmacology.
4. Study of use of anesthetics in laboratory animals.
5. To record the dose response curve of Acetylcholine using isolated rat ileum/rectus abdominis muscle preparation.
6. To carry out bioassay of Ach using isolated rat ileum/rectus abdominis muscle preparation by interpolation method.
7. To carry out bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by three point method.
8. To record the dose response curve of Histamine using isolated guinea-pig ileum preparation.
9. To carry out bioassay of Histamine using isolated guinea-pig ileum preparation by interpolation method.
10. To carry out bioassay of Histamine using guinea-pig ileum preparation by three point method.
11. Study of agonistic and antagonistic effects of drugs using isolated guinea-pig ileum preparation.
12. To study different routes of administration of drugs in animals (Rats, Mice, Rabbits).
13. Study of theory, principle, procedure involved and interpretation of given results for the following experiments:
  - a) Analgesic property of drug using analgesiometer (tail flick and hotplate).
  - b) Antiinflammatory effect of drugs using rat-paw edema method.
  - c) Anticonvulsant activity of drugs using maximal electroshock and pentylene tetrazole methods.
  - d) Antidepressant activity of drugs using pole climbing apparatus.
  - e) Pentobarbitone induced sleeping time in mice.
  - f) Locomotor activity of drugs using actophotometer.
  - g) Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations.
  - g) Skeletal muscle relaxant activity of the drugs using rotarod.
  - h) Drugs effect on the blood pressure, heart rate and respiratory rate of dog.
14. Simulated experiments
  - a) Effect of drugs on frog's isolated heart.
  - b) Effect of drugs on rabbit eye.
  - c) Effect of drugs on ciliary motility of frog's esophagus.

**Scheme of Practical Examination**

	Sessional	Annual
Identification	04	10
Synopsis	04	10
Major Experiment (Bioassay)	06	30
Minor Experiment (Interpretation of given Graph/ simulated Experiment)	04	10
Viva	02	10
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>3 hrs</b>	<b>4 hrs</b>

Note: Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).

## 3.2 PHARMACEUTICAL ANALYSIS (THEORY)

**Theory: 3 Hrs. /Week**

**Responsible member/s of the academic staff: Dr. R S Chandan (RSC)**

**Scope and objectives:** This course is designed to impart a fundamental knowledge on the art and science of testing drugs by various instrumental methods of analysis. This focuses on various modern instruments that are used for testing the purity of drugs in various dosage forms. This course also gives idea about modern instruments that are used for drug testing like NMR, IR, Mass, HPLC, HPTLC forms. etc,. It prepares the students for most basics of the applied field of pharmacy.

**At completion of this course it is expected that students will be able to:  
(Student learning outcomes)**

**Theory:**

1. explain the principle involved in various analytical techniques
2. describe the construction and working of various analytical instruments
3. summarize the applications of analytical instruments in quantitative analysis of drugs
4. explain the calibration and validation of various instruments and their importance
5. describe principles of chromatographic methods and its applications

**Practical:**

1. prepare various standard and sample solutions using appropriate procedure
2. perform the quantitative analysis of the drug using appropriate instrumental techniques
3. carryout qualitative analysis of drugs by chromatographic methods

**Teaching/learning methodologies used:**

1. Lecture
2. Practical/Lab

**Course materials:**

### TEXT BOOKS

- a. Instrumental methods of analysis by Willard, Merrit, Dean and Settle 6th edition
- b. Practical Pharmaceutical Chemistry Vol-II- Beckett and Stenlake 3rd edition

### REFERENCE BOOKS

- a. Text book of quantitative chemical analysis by A.I. Vogel
- b. Text book of Pharmaceutical Analysis by K.A. Cannors
- c. Pharmaceutical analysis by Skoog and West.
- d. William Kemp- Spectroscopy methods.

## Lecture wise Programme

TOPICS	Hrs
<b>1. Quality Assurance:</b>	
a. Introduction, sources of quality variation, control of quality variation.	<b>03</b>
b. Validation methods- quality of equipment, validation of equipment and validation of analytical instruments and calibration.	
<b>2. Chromatography:</b> Introduction, history, classification, separation techniques, choice of methods. The following techniques be discussed with relevant examples of pharmaceutical products involving principles and techniques of separation of drugs from excipients.	<b>01</b>
a. <b>Column Chromatography:</b> Adsorption column chromatography, Operational technique, frontal analysis and elution analysis. Factors affecting column efficiency, applications and partition chromatography.	<b>03</b>
b. <b>TLC:</b> Introduction, principle, techniques, $R_f$ value and applications.	<b>02</b>
c. <b>PC:</b> Introduction, principle, types of paper chromatography, preparation techniques, development techniques, applications.	<b>02</b>
d. <b>Ion-exchange chromatography:</b> Introduction, principles, types of ion exchange synthetic resins, physical properties, factors affecting ion exchange, methodology and applications.	<b>03</b>
e. <b>HPLC:</b> Introduction, theory, instrumentation, and applications.	<b>03</b>
f. <b>HP TLC:</b> Introduction, theory, instrumentation, and applications.	<b>02</b>
g. <b>Gas Chromatography:</b> Introduction, theory, instrumentation-carrier gases, types of columns, stationary phases in GLC & GSC. Detectors-Flame ionization detectors, electron capture detector, thermal conductivity detector. Typical gas chromatogram, derivatisation techniques, programmed temperature gas chromatography, applications.	<b>04</b>
h. <b>Electrophoresis:</b> Principles of separation, equipment for paper and gel electrophoresis, and application.	<b>02</b>
i. <b>Gel filtration and affinity chromatography:</b> Introduction, technique, applications.	<b>03</b>
<b>3. Electrometric Methods:</b>	
Theoretical aspects, instrumentation, interpretation of data/spectra and analytical applications be discussed on the following topics.	
a. <b>Potentiometry:</b> Electrical potential, electrochemical cell, reference electrodes, indicator electrodes, measurement of potential and pH, construction and working	<b>05</b>

of electrodes, Potentiometric titrations, methods of detecting end point, Karl Fischer titration.

**b. Conductometry:** Introduction, conductivity cell, conductometric titrations and applications. **03**

**c. Amperometric Titrations:** Introduction, types of electrodes used, reference and indicator electrode, instrumentation, titration procedure, advantages and disadvantages of Amperometry over Potentiometry. Pharma applications. **04**

#### **4. Spectroscopy:**

Theoretical aspects, instrumentation, elements of interpretation of data/spectra and application of analytical techniques be discussed on:

**a. Absorption Spectroscopy:** **08**

Theory of electronic, atomic and molecular spectra. Fundamental laws of photometry, Beer-Lambert's Law, application and its deviation, limitation of Beer law, application of the law to single and multiple component analysis, measurement of equilibrium constant and rate constant by spectroscopy. Spectra of isolated chromophores, auxochromes, batho-chromic shift, hypsochromic shift, hyperchromic and hypochromic effect, effect of solvent on absorption spectra, molecular structure and infrared spectra.

**Instrumentation** – Photometer, U.V.-Visible spectrophotometer – sources of U.V.-Visible radiations, collimating systems, monochromators, samples cells and following detectors-Photocell, Barrier layer cell, Phototube, Diode array, applications of U.V.-Visible spectroscopy in pharmacy and spectrophotometric titrations. **05**

**b. Infrared Spectroscopy:** Vibrational transitions, frequency – structure correlations, Infrared absorption bands, Instrumentation-IR spectro-meter – sources of IR, Collimating systems, monochromators, sample cells, sample handling in IR spectroscopy and detectors-Thermocouple, Golay Cells, Thermistor, Bolometer, Pyroelectric detector, Applications of IR in pharmacy. **06**

**c. Fluorimetric Analysis:** Theory, luminescence, factors affecting fluorescence, quenching. Instrumentation, Applications, fluorescent indicators, study of pharmaceutically important compounds estimated by fluorimetry. **04**

**d. Flame Photometry:** Theory, nebulisation, flame and flame temperature, interferences, flame spectrometric techniques and instrumentation and pharmaceutical applications. **04**

**e. Atomic Absorption Spectrometry:** Introduction, Theory, types of electrodes, instrumentation and applications. **02**

**f. Atomic Emission Spectroscopy:** Spectroscopic sources, atomic emission spectrometers, photographic and photoelectric detection. **02**



- g.NMR (introduction only):** Introduction, theoretical aspects and applications **02**
- h.Mass Spectroscopy: (Introduction only) –** Fragmentation, types of ions produced, mass spectrum and applications. **02**

### Theory Sessional examination syllabus

Sessional No.	Syllabus
	Chapters no.
I	2
II	3, 4a
III	1, 4b – 4h

## 3.2 PHARMACEUTICAL ANALYSIS (PRACTICALS)

**Theory: 75 Hours (3 Hrs/ Week)**

**Responsible member/s of the academic staff: Dr. R S Chandan (RSC)**

**General Requirements:** Graph paper, pencil, Scale, Scissors, Butter Paper, Observation Book-200 pages (plain), Gum Tube or stick, Matchbox, Laboratory Napkin

### List of Experiments:

1. Separation and identification of Amino Acids by Paper Chromatography\*.
2. Separation and identification of Dyes by radial paper chromatography\*.
3. Separation and identification of Sulpha drugs by TLC technique\*.
4. Effect of pH and solvent on the UV spectrum of given compound\*.
5. Determination of dissociation constant of indicators using UV-Visible spectroscopy\*.
6. Conductometric titration of mixture of acids with a strong base\*\*.
7. Potentiometric titration of strong acid with a strong base\*\*.
8. Estimation of drugs by Fluorimetric technique\*\*.
9. Study of quenching effect in fluorimetry\*\*.
10. Colorimetric estimation of Sulpha drugs using BMR reagent\*\*.
11. Simultaneous estimation of two drugs present in given formulation\*\*.
12. Assay of Dextrose by colorimetry\*\*
13. Colorimetric estimation of Ferrous ions using 1,10-Phenanthroline\*\*.
14. UV spectroscopic estimation of Paracetamol tablets\*
15. Determination of Chlorides and Sulphates in Calcium gluconate by Nepheloturbidimetric Method\*\*.
16. Determination of Na/K by Flame Photometry\*\*.
17. Determination of pKa using pH meter\*.
18. Infrared spectral graphs/ peak identification of samples with different functional groups (-COOH, -COOR, -NH<sub>2</sub>, -NHR, -OH, -CHO, -C=O)
19. Demonstration of HPLC.

**SCHEME OF PRACTICAL EXAMINATION:**

	<b>Sessional</b>	<b>Annual</b>
Synopsis	04	10
Major Experiment(Experiment indicated by**)	08	30
Minor Experiment(Experiment indicated by*)	04	20
Viva-Voce	04	10
<b>Max. Marks</b>	<b>20#</b>	<b>70</b>

**#Note:** Total sessional marks is 30 (20 for practical sessional and 10 marks for regularity, promptness, viva-voce and record maintenance)

### 3.3 PHARMACOTHERAPEUTICS–II (THEORY)

**Theory: 3 Hrs. /Week**

**Responsible member/s of the academic staff: Mr Balaji S (BS)**

**Scope and Objectives:** This course is designed to impart knowledge and skills necessary for contribution to quality use of medicines. Chapters dealt cover briefly pathophysiology and mostly therapeutics of various diseases. This will enable the student to understand the pathophysiology of common diseases and their management.

**At completion of this course it is expected that students will be able to:  
(Student learning outcomes)**

**Theory:**

1. describe the etiopathogenesis of selected diseases and correlate them to clinical condition(s) of the respective disease.
2. explain the general therapeutic approach to management of selected diseases.
3. apply the knowledge to justify the clinical controversies and rationale in individualizing drug therapy plans.
4. distinguish the management strategies of selected diseases in special populations.
5. assess drug safety monitoring, contraindications and treatment outcomes and modify treatment plan as needed.

**Practical:**

1. Gather and analyse patient medical records and prepare pharmaceutical care plan.
2. Perform treatment chart review and identify medication related problems (MRPs).
3. Communicate and resolve MRPs to concerned health care professionals.
4. Perform the patient medication counselling as per the requirement of the patient and/or recommended by a clinician.

**Teaching/learning methodologies used:**

1. Lecture
2. Practical/Lab
3. Discussion
4. Case Study

**Course materials**

**TEXT BOOKS**

- a. Clinical Pharmacy and Therapeutics - Walker and Whittlesea, Churchill Livingstone publication

**REFERENCE BOOKS**

- a. Pharmacotherapy: A Pathophysiologic approach - Joseph T. Dipiro et al. Appleton & Lange

- b. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication  
 c. Applied Therapeutics: The clinical Use of Drugs. Lloyd Young and Koda-Kimble

### Lecture wise Program

#### Etiopathogenesis and pharmacotherapy of diseases associated with following systems/ diseases .

Topic	Hrs
<b>Infectious diseases:</b>	<b>37</b>
Guidelines for the rational use of antibiotics and surgical Prophylaxis, Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection- Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonorrhoea and Syphilis	
<b>Musculoskeletal disorders</b>	<b>12</b>
Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic lupus erythematosus	
<b>Renal system</b>	<b>10</b>
Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders	
<b>Oncology:</b>	<b>10</b>
Basic principles of Cancer therapy, General introduction to cancer chemotherapeutic agents, Chemotherapy of breast cancer, leukemia. Management of chemotherapy induced nausea and emesis	
<b>Dermatology:</b>	<b>06</b>
Psoriasis, Scabies, Eczema, Impetigo	

#### Theory Sessional examination syllabus

Sessional No.	Syllabus Chapters No.
I	1 (14 hours), 2
II	1 (14 hours), 3
III	1 (9 hours), 4,5

### 3.3 PHARMACOTHERAPEUTICS-II (PRACTICALS)

**Theory: 75 Hours (3 Hrs/ Week)**

**Responsible member/s of the academic staff: Mr Balaji S (BS)**

Hospital postings for a period of at least one month is required to understand the principles and practice involved in ward round participation and clinical discussion on selection of drug therapy. Students are required to maintain a record of 15 cases observed in the ward and the same should be submitted at the end of the course for evaluation.

#### ASSIGNMENTS

Students are required to submit written assignments on the topics given to them. Topics allotted should cover recent developments in drug therapy of various diseases. A minimum of THREE assignments [1500 – 2000 words] should be submitted for evaluation.

#### Format of the assignment

- Minimum & Maximum number of pages.
- Reference(s) shall be included at the end.
- Assignment can be a combined presentation at the end of the academic year
- It shall be computer draft copy
- Name and signature of the student
- Time allocated for presentation may be 8+2 min

#### Scheme of Practical Examination

	Sessional	Annual
Synopsis	05	15
Major Experiment	10	25
Minor Experiment	03	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03 hrs</b>	<b>04 hrs</b>

*\* Total Sessional marks is 30 (20 for practical Sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance)*

### 3.4 PHARMACEUTICAL JURISPRUDENCE (THEORY)

**Theory: 2Hrs/Week**

**Responsible member/s of the academic staff: Dr. Balamuralidhara V(BMV)**

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

**At completion of this course it is expected that students will be able to:  
(Student learning outcomes)**

1. Explain Pharmaceutical legislations and their implications in the development and marketing of Pharmaceuticals
2. Write various prevailing Indian pharmaceutical Acts and Laws
3. Describe the role and responsibilities of regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. Apply code of ethics during the pharmaceutical practice
5. Explain basic concept of National Pharmaceutical Pricing Authority and Intellectual Property Rights

**Teaching/learning methodologies used:**

1. Lecture
2. Oral presentation

**Course materials**

#### TEXT BOOKS

Mithal , B M. Textbook of Forensic Pharmacy. Calcutta: National; 1988.

#### REFERENCE BOOKS

- a. Singh, KK, editor. Beotra's the Laws of Drugs, Medicines & cosmetics. Allahabad: Law Book House; 1984.
- b. Jain, NK. A Textbook of forensic pharmacy. Delhi: Vallabhprakashan ; 1995.
- c. Reports of the Pharmaceutical enquiry Committee
- d. I.D.M.A., Mumbai. DPCO 1995
- e. Various reports of Amendments.
- f. Deshapande, S.W. The drugs and magic remedies act 1954 and rules 1955. Mumbai: Susmit Publications; 1998.
- g. Eastern Book Company .The narcotic and psychotropic substances act 1985, Lucknow: Eastern; 1987.

**Lecture wise program**

<b>No.</b>	<b>Topic</b>	<b>Hrs</b>
<b>1</b>	<b>Pharmaceutical Legislations – A brief review.</b> - Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee	<b>02</b>
<b>2</b>	<b>Code of Pharmaceutical ethics</b> - Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath	<b>02</b>
<b>3</b>	<b>Drugs and Cosmetics Act, 1940 and its rules 1945.</b> - Objectives, Definitions, Legal definitions of schedules to the act and rules - Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties. - Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license. Detailed study of schedule M, N and Y. Offences and penalties - Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties - Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties - Administration of the act and rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government analysts, Licensing authorities, controlling authorities, Drug Inspectors	<b>22</b>
<b>4</b>	<b>Pharmacy Act –1948.</b> Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; its constitution and functions, Registration of Pharmacists, Offences and Penalties.	<b>05</b>
<b>5</b>	<b>Medicinal and Toilet Preparation Act –1955.</b> Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent&Proprietary Preparations. Offences and Penalties	<b>04</b>
<b>6</b>	<b>Narcotic Drugs and Psychotropic substances Act-1985 and Rules.</b> Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties	<b>04</b>
<b>7</b>	<b>Study of Salient Features of Drugs and magic remedies Act and its rules.</b> Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties	<b>02</b>

<b>8</b>	<b>Drug Price control Order &amp; National Drug Policy (Current).</b> - Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, Implementation of prices Fixed/ revised. <b>Pharmaceutical Policy 2002:</b> Objectives, Approaches in the review, Salient features of Pharmaceutical Policy 2002.	<b>02</b>
<b>9</b>	<b>Prevention Of Cruelty to animals Act-1960.</b> Objectives, Definitions, Institutional Animal Ethics Committee, Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties	<b>03</b>
<b>10</b>	<b>Patents &amp; design Act-1970.</b> - Objectives, definitions, Types of patent, PCT, Patentable and not patentable inventions, Applications for patents, Term of patent, revocation of patents, compulsory licensing, Offences and penalties. - Registration of designs, copyright, prohibition of certain designs, cancellation of designs, Offences and penalties.	<b>03</b>
<b>11</b>	<b>Brief study of prescription and Non-prescription Products.</b>	<b>01</b>

**Assignments: Format of the assignment**

1. Minimum & Maximum number of pages
2. It shall be a computer draft copy
3. Reference(s) shall be included at the end.
4. Name and signature of the student
5. Assignment can be a combined presentation at the end of the academic year.
6. Time allocated for presentation may be 8+2 Min

**Case studies relating to**

1. Drugs and Cosmetics Act and rules along with its amendments, Dangerous Drugs Act, Medicinal and Toilet preparation Act, New Drug Policy, Professional Ethics, Drugs (Price control) Order, Patent and Design Act.
2. Various prescription and non-prescription products.
3. Medical and surgical accessories.
4. Diagnostic aids and appliances available in the market.

**Theory Sessional examination syllabus**

Sessional No.	Syllabus
	Chapters no.
I	1 to 3
II	3 to 5
III	6 to 11



### 3.5 MEDICINAL CHEMISTRY (Theory)

**Theory: 3 Hrs. /Week**

**Responsible members of the academic staff: Dr Yogish Kumar H (HYK)**

**1. Scope and Objectives:** This course is designed to impart a fundamental knowledge on the structure and functions of the different drugs. The course gives details of Chemistry, Mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR) and uses of Chemotherapeutic Agents, Cardiovascular Drugs and synthesis of some important drugs. The course also covers modern techniques of drug design, which include Prodrug concept and combinatorial chemistry.

**At completion of this course it is expected that students will be able to:**

**(Student learning outcomes)**

**Theory:**

1. explain the different concept of rational drug design and their significance in drug discovery
2. classify the various categories of therapeutic agents based on their chemical nature
3. correlate the pharmacodynamic and pharmacokinetic properties with the structural feature of the drug molecules.
4. explain the biochemical basis of the pharmacological activities of the drug substances.
5. write the synthetic route for the selected drug molecules.

**Practical:**

1. write the chemical reactions for the preparation of drug molecules/intermediates
2. explain the principle involved in the volumetric analysis of drug substances.
3. prepare and purify the drug molecules/intermediates using appropriate procedure.
4. carryout the assay of the drug substance using appropriate methodology.

**Teaching/learning methodologies used:**

1. Lecture
2. Practical/Lab

**2. Course materials:**

**TEXT BOOKS**

- a. Wilson and Giswolds, Text book of Organic and pharmaceutical chemistry
- b. Principles of Medicinal chemistry- William O. Foye

**REFERENCE BOOKS**

- a. A I Vogel Text book of Practical Organic Chemistry
- b. Text Book of organic chemistry by I. L. Finar
- c. S.N. Pandeya, A Text Book of Medicinal Chemistry, S.G. Publisher, Varanasi, Vol I & II.

## 3. Lecture wise Programme:

	<b>Topic</b>	<b>Hrs</b>
<b>I</b>	<b>Modern concept of rational drug design:</b> A brief introduction to prodrug & Drug latention, combinatorial chemistry, general pathways & factors affecting drug metabolism.	<b>04</b>
<b>II</b>	A study of the development of the following classes of drugs including SAR, mechanism of action, synthesis of important compounds (marked with asteric*), brand names of important marketed products and their side effects.	<b>15</b>
<b>1.</b>	<b>Anti-infective agents:</b>	
	<b>a) Local anti-infective agents:</b> Alcohols, Phenols, Cationic surfactants, Nitrofurans.	
	<b>b) Antifungal agents:</b> Azoles, Miscellaneous & Antifungal Antibiotics.	
	<b>c) Urinary tract anti-infectives:</b> SAR of quinolone antibacterial agents, Norfloxacin, ciprofloxacin*, sparfloxacin, ofloxacin,	
	<b>d) Antitubercular agents:</b> Management of tuberculosis. <b>Synthetic anti TB agents:</b> INH*, Pyrizinamide, Ethambutol. <b>Anti TB antibiotics:</b> Rifampin, Capreomycin	
	<b>e) Antiviral agents and Anti AIDS agents:</b> Amantadine, Acyclovir, Trifluridine, Zidovudine, stavudine.	
	<b>f) Antiprotozoal agents:</b> Introduction to protozoal diseases and causative Organisms. Metronidazole, diloxanide furoate, dehydroemetine, nifurtimox	
	<b>g) Anthelmintics:</b> Benzimidazoles & miscellaneous.	
<b>2</b>	<b>Sulfonamides and sulfones</b>	<b>05</b>
	History and development of sulfonamides, SAR and mechanism of action of Sulfonamides. Sulfamethoxazole, sulfisoxazole, sulfacetamide*, sulfasalazine, Folate reductase inhibitors, trimethoprim*, synergistic action of cotrimoxazole. Sulfones: Dapsone	
<b>3.</b>	<b>Antimalarials:</b>	<b>05</b>
	Etiology of malaria, SAR and mechanism of action of quinoline Antimalarials. Chloroquine, pamaquine*, quinacrine, pyrimethamine, cycloguanil	
<b>4.</b>	<b>Antibiotics</b>	<b>12</b>
	Historical background and classification of antibiotics. <b>Beta lactam antibiotics:</b> Development of acid resistant and extended spectrum Penicillins. Penicillin G, ampicillin, amoxicillin, cloxacillin. <b>Beta lactamase inhibitors:</b> Clavulanic acid, Thienamycin. <b>Cephalosporins:</b> Cephalexin, Cefadroxil, Cefuroxime. <b>Aminoglycosids:</b> Streptomycin, Neomycin, Amikacin, Gentamicin. <b>Tetracyclines:</b> Chemistry and SAR of tetracyclines, chlortetracycline, doxycycline, Minocycline. <b>Macrolides:</b> Erythromycin, Azithromycin <b>Miscellaneous:</b> Clindamycin, Bacitracin, Chloramphenicol*.	
<b>5.</b>	<b>Antineoplastic agents</b>	<b>06</b>
	Historical background and classification of antineoplastic agents. <b>Alkylating agents:</b> Cyclophosphamide, Mechlorethamine, Cholrambucil. <b>Antimetabolites:</b> Mercaptopurine, Flurouracil, Methotrexate. <b>Antibiotics:</b> Dactinomycin, Mitomycin, Streptozocin. <b>Plant products:</b> Etoposide, Taxol, Vincristine and Vinblastine. <b>Miscellaneous:</b> Cisplatin, Interferons.	

- 6 Cardiovascular agents 12**
- a) Antianginal agents and vasodilators**  
**Nitrovasodilators:** Amyl nitrite, Isosorbide dinitrate  
**Calcium channel blockers:** Verapamil, Diltiazem
- b) Antiarrhythmic agents:**  
**Class I:** Quinidine, Phenytoin, Lidocaine, Encainide  
**Class II:** Beta blockers- Propranolol  
**Class III:** Amiodarone  
**Class IV:** Calcium channel blockers: Verapamil, Diltiazem.
- c) Antihypertensive agents:**  
**Betablockers:** Propranolol\*,  
**ACE inhibitors:** Captopril, Enalapril  
**Angiotensin antagonists:** Losartan  
**Calcium channel blockers:** Nifedipine, Amlodipine  
**Adrenergic agents:** Clonidine, Methyl Dopa  
**Adrenergic antagonists:** Prazosin, Reserpine
- d) Antihyperlipidemic agents:** Types of hyperlipoproteinemia. clofibrate, fenofibrate, cholestyramine, lovastatin, simvastatin.
- e) Anticoagulants:** Warfarin, Dicumarol, Anisindione
- 7. Hypoglycemic agents: 03**  
**History, development and SAR of sulfonylureas:** Tolbutamide\*, Chlorpropamide, Glipizide  
**Metaglinides:** Repaglinide  
**Thiazolidiones:** Rosiglitazone, Pioglitazone  
**Biguanides:** Metformin, Phenformin  
**Miscellaneous:** Acarbose, Miglitol
- 8. Thyroid and Antithyroid agents: 01**  
L-thyroxine, L-threonine, methimazole  
Propyl thiouracil.
- 9. Diuretics: 05**  
**Carbonic anhydrase inhibitors:** Acetazolamide\*  
**Thiazide diuretics:** SAR of thiazide diuretics, Chlorthiazide, Benzthiazide, Xipamide, Chlorthalidone.  
**Loop diuretics:** Frusemide\*, Ethacrynic Acid  
**Potassium sparing diuretics:** Spiranolactone, Amiloride  
**Miscellaneous:** Mannitol.
- 10. Diagnostic agents 02**  
Iodipamide, Diatrizoate Sodium amino hippurate, Sulfobromophthalein, Fluorescein sodium.
- 11 Steroidal Hormones and Adrenocorticoids 05**  
**Estrogens:** Estradiol, DES  
**Progestines:** Progesterone, Norethindrone, Testosterone, Nandralone  
Betamethasone, Prednisolone, Beclomethasone

**Theory Sessional examination syllabus**

Sessional No.	Syllabus
	Chapters no.
I	I & II (1 & 2)
II	3 to 5
III	6 to 11

**3.5 MEDICINAL CHEMISTRY (PRACTICALS)****Theory: 75 Hours (3 Hrs/ Week)****Responsible member/s of the academic staff: Dr Yogish Kumar H (HYK)****General Requirements:** Observation Book, Match Box, Napkin, Butter paper, Marker pen, Self sealing pouch.**List of experiments**

- A. Assays of important drugs from the course content. 8**
1. Assay of ascorbic acid by cerimetry
  2. Assay of ascorbic acid by Iodimetry
  3. Assay of metronidazole by NAT
  4. Assay of chloroquine phosphate by NAT
  5. Assay of dapsone by diazotization
  6. Assay of INH by bromometry
  7. Assay of analgin by iodimetry
  8. Assay of diclofenac by alkalimetry
- B. Preparation of medicinally important compounds or intermediates required for synthesis of drugs 10**
1. Preparation of 2,3 diphenyl quinoxaline from OPDA
  2. Preparation of benzotriazole from OPDA
  3. Preparation of benzimidazoles from OPDA
  4. Preparation of 7-hydroxy 4-methyl coumarin
  5. Preparation of benzyl from benzoin
  6. Preparation of phenytoin from benzil
  7. Preparation of phenothiazine from diphenyl amine
  8. Preparation of chlorbutanol
  9. Preparation of eosin from resorcinol
  10. Preparation of fluorescein from eosin
  11. Preparation of triphenyl imidazole from benzoin
- C. Monograph analysis of important drugs. 5**
1. Monograph analysis of ibuprofen
  2. Monograph analysis of aspirin
  3. Monograph analysis of caffeine
  4. Monograph analysis of a sulfa drug
  5. Monograph analysis of paracetamol
- D. Determination of partition coefficients, dissociation constants of drug substances 2**

**Scheme of Practical Examination:**

	<b>Sessionals</b>	<b>Annual</b>
Synopsis	04	10
Major Experiment	06	30
Minor Experiment	06	20
Viva	04	10
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03 hrs</b>	<b>04 hrs</b>

*\* Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).*

### 3.6 PHARMACEUTICAL FORMULATIONS (THEORY)

**Theory: 2 Hrs. /Week**

**Responsible member/s of the academic staff: Mr. Mahendran B (BM)**

**Scope and Objective:** This subject is designed to impart knowledge and skills necessary for formulation and evaluation of various pharmaceutical dosage forms. Chapters dealt cover briefly about solid, liquid, semi-solid dosage forms and injectable preparations. Advancements in drug delivery systems, novel drug delivery systems are also dealt in the subject.

**At completion of this course it is expected that students will be able to:**  
**(Student learning outcomes)**

**Theory:**

1. describe the principle involved in formulation of various pharmaceutical dosage forms
2. appraise the formulation techniques of solid, liquid and semisolid dosage forms and their evaluation parameters
3. explain the principle and formulation strategies of Novel drug delivery systems

**Practical:**

1. formulate and evaluate solid dosage forms (tablets and capsules) using different methods and relevant test procedures
2. prepare parenterals and perform quality control tests using pharmacopoeial methods
3. formulate and evaluate liquid dosage forms (syrups and antacid gels)
4. formulate and evaluate semi solid dosage forms (ointment and gel)
5. prepare cosmetic products

**Teaching/learning methodologies used:**

1. Lecture
2. Practical/Lab
3. Discussion

**Course materials**

**TEXT BOOKS**

- a. Pharmaceutical dosage forms, Vol, I, II and III by Liberman & Lachman
- b. Tutorial Pharmacy – Cooper & Gun
- c. Rowlings Text book of Pharmaceutics

**REFERENCE BOOKS**

- a. Remington's Pharmaceutical Sciences
- b. United States Pharmacopoeia / British Pharmacopoeia /IP

**Lecture wise Programme:**

No.	Topic	Hrs
1	<b>Pharmaceutical dosage form:</b> Concept and classification	03
2	<b>Tablets:</b> Formulation of different types of tablets, tablet excipients, granulation techniques, Tablet coating, Type of coating, quality control tests and evaluation for uncoated and coated tablets.	10
3	<b>Capsules:</b> Production and filling of hard gelatin capsules, Raw materials for shell, finishing. Production and filling of soft gelatin capsules, Importance of base adsorption, quality control tests for hard and soft gelatin capsules.	07
4	<b>Liquid orals:</b> Formulation, Manufacturing and evaluation of suspensions, emulsions and solutions. Instability problems in suspensions and emulsions.	06
5	<b>Parenterals:</b> Definition, types, advantages and limitation, general formulation, vehicles, production procedure, production facilities, and controls. Formulation of injections, sterile powders, implants and long acting parenterals, emulsions and suspensions. Containers and closures pertinent to sterile preparations, Pharmacopoeial quality control tests for parenterals, Sterilization and evaluation.	10
6	<b>Semi-Solids:</b> Introduction and classification Factors affecting absorption, Packaging, storage and labeling. Ointments: Types of Ointment Base Preparation of ointment. Gels: Types and formulation of Gels	06
7	<b>Definition and concept of Controlled and novel Drug delivery systems</b> with available examples, viz. transdermal, buccal, vaginal, nasal, implantable, ocular drug delivery systems.	08

**Theory Sessional examination syllabus**

Sessional No.	Syllabus
	Chapters no.
I	1 to 3 (Hard Gelatin Capsules)
II	3, (Soft gelatin capsules), 4 & 5
III	6 to 7

### 3.6 PHARMACEUTICAL FORMULATIONS (PRACTICALS)

**Practicals: 3 Hrs. /Week**

**Responsible member/s of the academic staff: Mr. Mahendran B (MB)**

**List of Experiments:**

- 1. Manufacture of Tablets**
  - a. Ordinary compressed tablet-wet granulation
  - b. Tablets prepared by direct compression.
  - c. Soluble tablet.
  - d. Chewable tablet.
- 2. Formulation and filling of hard gelatin capsules**
- 3. Manufacture of parenterals**
  - a. Ascorbic acid injection
  - b. Calcium gluconate injection
  - c. Sodium chloride infusion.
  - d. Dextrose and Sodium chloride injection/ infusion.
- 4. Evaluation of Pharmaceutical formulations (QC tests)**
  - a. Tablets
  - b. Capsules
  - c. Injections
- 5. Formulation of two liquid oral preparations and evaluation by assay**
  - a. Solution: Paracetamol Syrup
  - b. Antacid suspensions- Aluminum hydroxide gel
- 6. Formulation of semisolids and evaluation by assay**
  - a. Salicylic acid and benzoic acid ointment
  - b. Gel formulation Diclofenac gel
- 7. Cosmetic preparations**
  - a. Lipsticks
  - b. Cold cream and vanishing cream
  - c. Clear liquid shampoo
  - d. Tooth paste and tooth powders.
- 8. Tablet coating (demonstration)**

#### Scheme of Practical Examination:

	Sessionals	Annual
Synopsis	04	15
Major Experiment	08	25
Minor Experiment	06	15
Viva	02	15
<b>Max Marks</b>	<b>20</b>	<b>70</b>
<b>Duration</b>	<b>03 hrs</b>	<b>04 hrs</b>

*Note: Total sessional marks is 30 (20 for practical sessional plus 10 marks for regularity, promptness, viva-voce and record maintenance).*



**JSS Academy of Higher Education & Research**  
**JSS College of Pharmacy, Mysuru**

**Modified Schedule and Link for Online Classes – PharmD**

(w.e.f 01-06-2020)

**PharmD – Third Year**

<b>Day</b>	<b>09:00 AM to 09:50 AM</b>	<b>02:00 PM to 02:50 PM</b>	<b>03:00 PM to 03:50 PM</b>	<b>04:00 PM to 04:50 PM</b>
<b>Mon</b>	Pharmaceutical Formulations	Pharmaceutical Analysis	Pharmacology-II	Pharmacotherapeutics-II
<b>Tue</b>		Medicinal Chemistry	Pharmacology-II	Pharmaceutical Jurisprudence
<b>Wed</b>	Pharmaceutical Formulations	Pharmaceutical Analysis	Medicinal Chemistry	Pharmacotherapeutics-II
<b>Thu</b>		Medicinal Chemistry	Pharmacology-II	Pharmaceutical Jurisprudence
<b>Fri</b>	Pharmaceutical Formulations	Pharmaceutical Analysis	Pharmaceutical Jurisprudence	Pharmacotherapeutics-II

**JSS Academy of Higher Education & Research**  
**JSS College of Pharmacy**  
 Sri Shivarathreshwara Nagara, Mysore-570015  
**CLASS TIME TABLE- 2020-21**

**Class: PHARM. D –THIRD YEAR**

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		11.10-12.05PM	12.05-1.00PM		2.00-2.55PM	2.55-3.50PM		4.05-5.00PM	5.00-5.55 PM			
<b>Monday</b>	Medicinal Chemistry HYK	Pharmacology –II KLK		Pharm. Formulation BM	-----		←-BII -----BM----- Pharm. ←BI -- KLK -- Pharmacology			Formulation--→ -II-----→	-----			
<b>Tuesday</b>	-----	←BII----- BS ←BI ---- BM--	T E A  B R E A K	---Pharmaco Therapeutics-II---→ --- Pharm. Formulation-----→		L U N C H  B R E A K	Pharmaco Therapeutics-II BS	Pharm. Analysis RSC	T E A  B R E A K	Pharmaco Therapeutics-II BS	-----			
<b>Wednesday</b>	Pharm. Analysis RSC	Medicinal Chemistry HYK		Pharmacology –II KLK	Pharm. Formulation(Tu) BM			Medicinal Chemistry HYK		Pharmacology – II KLK		Pharm. Juris. BMV	-----	
<b>Thursday</b>	Pharm. Analysis RSC	←BII-- KSN ←BI ---- HYK		-----Pharmacology –II-----→ -----Medicinal Chemistry -----				Pharm. Juris. BMV		Pharmacology – II (Tut) KLK		-----	-----	
<b>Friday</b>	Pharm. Analysis (Tu) RSC	←-BI--- BS ←BII----- AKT		----- Pharm. Therapeutic-I -----→ ----- Pharmaco Analysis-----→				Pharmaco Therapeutics-II BS		Medicinal Chemistry (Tut) HYK		Pharmaco Therapeutics-II BS	-----	
<b>Saturday</b>	Pharm. Formulation BM	←BI----- RSC-- ←BII ---- HYK --		----- Pharm. Analysis -----→ ----- Medicinal Chemistry -----→				-----						

\*Effective from: 24<sup>th</sup> June 2020

Note: 1. No tea break for practicals

Time table Coordinator  
 Copy: SNB/LNB/SCF/e.copy – teachers/ Office in charge – time table / Time table coordinator

Principal

OPCS.1SOP(2)F(1)-0