NORTH MAHARASHTRA UNIVERSITY
(Introduced from June, 2012)

Ordinances Regulating Including Scheme and Syllabi relating to the Degree of Bachelor of Pharmacy (B. Pharm.) Degree Course (NEW) with effect from Academic Year (2012-13)

Course Title : Bachelor of Pharmacy

Abbreviation : B. Pharm.

Type of Course : A four year degree course divided into eight Semesters.

Pattern : Semester.

Number of Years and Semester : Four Years divided into eight semesters with two semesters per year.

Nomenclature of Semesters :

Semester-I & Semester-II	First Year B. Pharm.
Semester-III & Semester-IV	Second Year B. Pharm.
Semester-V & Semester-VI	Third Year B. Pharm.
Semester-VII & Semester-VIII	Final Year B. Pharm.

Award of the Degree : Degree will be awarded for those passing in all the eight semesters as per the rules and regulations given subsequently.

Duration of Semester : Each Semester will be normally of 15 weeks duration for class room teaching/ lecture and internal evaluation.

Definitions :

1. University means North Maharashtra University until and otherwise specified.
2. The college/Institute- Any college conducting B. Pharmacy course and affiliated to North Maharashtra University, Jalgaon.
3. State Govt.: Govt. of Maharashtra
4. Admission Authority: Any authority to conduct admission process as prescribed by Govt. of Maharashtra
5. Director / DTE – Directorate of Technical Education, Maharashtra State.
6. AICTE – All India Council of Technical Education, New Delhi

B. Pharm. 1 Entry levels into the course, eligibility criteria, admission authority and procedures.

Admission authority and procedure at the entry levels into the course will be as per the directions of Government of Maharashtra / Director of Technical Education/ All India Council of Technical Education, New Delhi prevailing at the time of admissions.
Entry levels into the course will be at the beginning of the Semester- I or at the beginning of the Semester -III.

B. Pharm.1.1 Eligibility Criteria for Admission at the entry level at Semester –I into the Course.

In order to secure admission to Semester –I of the Four year Degree Course in Pharmacy, the candidate should fulfill the following eligibility criteria;

- Passed the Higher Secondary Certificate (Std. XII) Examination of the Maharashtra State Board of Secondary and Higher Secondary Education, or its equivalent examination with English as one of the subjects.
  - ❖ All the subjects mentioned under Group-I and
  - ❖ Any one of the subjects from Group-II

AND

- Secured minimum 45% marks (40% for backward class candidates from Maharashtra) in Physics, Chemistry, and the subject of maximum marks amongst the four subjects of

Group-I: (all subjects from this group are compulsory)

1. Physics
2. Chemistry

Group-II: (any one of the subjects from this group)

1. Mathematics
2. Biology

OR

Must have passed Diploma in Pharmacy or its equivalent examination by Board of Technical education or equivalent examination. with not less than 45% of marks in the aggregate of all subjects taken together at the Final Year Examination.

O B. Pharm.1.2 Eligibility Criteria for Admission at the entry level of Semester-III (i.e. the first semester of Second Year B. Pharm.) into the Course

The candidate who has passed the final examination leading to the Diploma in Pharmacy conducted by the Board of Technical Education, Maharashtra State or equivalent examination from the institute approved by the Pharmacy Council of India and with a minimum 50% at part-II examination for the Diploma in Pharmacy Course (45% for backward class candidates from Maharashtra) as per ER-91 (i.e. Post H.S.C. two year Diploma Course) be held eligible for admission to semester-III.

O B. Pharm. 2 Examinations:

O B. Pharm. 2.1 Examination conducting authority: North Maharashtra University, Jalgaon

O B. Pharm. 2.2 Regular and Supplementary Examinations and time: (Tentative schedule) The University will decide exact schedule on the basis of prevailing situation.

Semester	Regular Examination	Supplementary Examination
I, III, V & VII	(November/December)	(April/May)
II, IV, VI & VIII	(April/May)	(November/December)

Duration of Examinations, Marks, etc. See examination scheme at Annexure

O B. Pharm. 2.3 Criteria for admitting the candidate for examinations irrespective of regular or supplementary examinations:

Candidate must have been admitted to the respective Semester as per the criteria for continuation into the respective Semesters given in O. B. Pharm. 3 and has kept the term for the Semester for which he is examined.

The candidate must submit prescribed application form along with fees.

Candidates must appear for the examination in the place and time as decided by the admitting Institute/ the University as the case may be.

Candidate who has failed in a particular Semester or has ATKT will be allowed to appear for the same examination on a new application being forwarded and a fresh fee paid.

Clarifications:

Candidate who has ATKT will appear for examinations in only those subject heads in which the candidate has failed except stated below.

The candidate who has passed in all the subjects but failed due to not getting overall 50% marks will be allowed to appear in any number of subject heads the candidate desires .

For all the remaining cases, the candidate has to appear for examination in all those subject heads in which the candidate has failed.
E_suvidha : For E_suvidha scheme, student should check the website for enrollment and examination timely.

O B. Pharm. 2.4 Periodic Tests (Sessional Examintion):

Each Semester will consist of a minimum of 15 weeks instructions.

*i.e. 15x6 = 90 instructional days (Actual teaching).

75% attendance is compulsory.

To ensure uniform attention of the students of their work throughout each semester of their study, Periodic tests will be conducted for each semester. Conducting authority shall be Institutes where candidate is admitted.

Number of Periodic tests (Sessional Examintion):

There will be a minimum of one sessional examination of 20 marks in each of the theory subjects during each semester.

One periodic test (Sessional Examination) will be conducted as per the examination scheme (See Annexure) for each semester. The students who will either secure less than 40% mark in the test or unable to appear for the scheduled periodic test may be permitted for the periodic test in the same semester only if approved by institutional examination committee and paying fees as prescribed by the institution.

Practical sessional examination of 20 marks will be based on internal assessment of practical, day to day attendance, viva, laboratory record. The distribution of marks for practical examination will be as given below –

Attendance - 40%

Viva Voce - 20%

Laboratory Record/Performance - 40%

Internal assessment of practicals (20%) will be based on day to day attendance, viva, laboratory record, etc.

The institutional examination committee shall consist of Principal (Chairman), & four teachers nominated by the Principal.

Time Schedule:

After completion of at least two thirds syllabus of the semester.

The Retest/ Improvement test/ or supplementary test for the periodic tests will be allowed for the failed candidates in the University examination, if he/she is appearing for the University exam of that subject head.

The Retest/ Improvement test/ or supplementary test shall be carried by the respective institution and the marks obtained by the candidate shall be forwarded to the University.

The institute conducting the course must submit the periodic test marks of the respective semester to the Controller of Examinations in soft copy and print before the commencement of theory or practical examination whichever is later.

Scaling down technique will be implemented for the periodic test.

O B. Pharm. 3 Continuation into the subsequent semesters after the entry level semesters. The admitting authority will be the individual institutes where the candidate has been admitted into the course, and the continuation will be as per the criteria decided by the University for each semester.

The following criteria are applicable to all the candidates for continuation.

O B. Pharm. 3.1 A candidate, to be eligible for the Degree will be required to pass examinations, as under:-

First year B. Pharm.	Semester-I & Semester-II
Second year B. Pharm.	Semester-III & Semester-IV
Third year B. Pharm.	Semester-V & Semester-VI
Fourth year B. Pharm.	Semester-VII & Semester-VIII

O B. Pharm. 3.2

No candidate will be admitted to any examination unless he/she keeps term at a College affiliated to the University, and produces, from the Principal of the College, testimonials of: Satisfactory attendance at the theory, Practical and term work classes as prescribed.

O B. Pharm. 3.3 – Promotion from odd semester to even semester in the same academic year-

a)A Candidate who fails in Semester - I examination of First Year B. Pharm. will be allowed to keep term for his/her Semester –II Examination, of First Year B. Pharm.

b) A Candidate who fails in Semester – III examination of Second Year B. Pharm. will be allowed to keep term for his/ her Semester – IV Examination of Second Year B. Pharm.
c) A Candidate who fails in Semester – V examination of Third Year B. Pharm. will be allowed to keep term for his/her Semester – VI Examination of Third Year B. Pharm.
d) A Candidate who fails in Semester – VII examination of Fourth Year B. Pharm. will be allowed to keep term for his Semester – VIII Examination of Fourth Year B. Pharm.

O B. Pharm. 3.4- Promotion to subsequent academic year-

A candidate who fails in more than one third of total number of subjects taken together at Semester I and Semester II / Semester III & Semester IV/Semester V & Semester VI course examination will not be permitted to keep terms in the higher class viz. Semester III & Semester IV/Semester V & Semester VI/Semester VII & Semester VIII of B. Pharm. course examination respectively.

O B. Pharm. 3.5-Clarification of 3.3 and 3.4-

a) No candidate will be admitted to the Semester III course unless he/she passes his/her Semester I and Semester II examination of B. Pharm.

OR

Passes in at least two third of total number of subjects at the Semester I and Semester II examination of B.Pharm. in accordance with O B. Pharm. 3.4

b) No candidate will be admitted to the Semester V course unless he/she –

i) passes his/her Semester I & Semester II., Semester III & Semester IV Examinations of B. Pharm.

OR

ii) passes his/her Semester I and Semester II examination of B. Pharm. and fails in not more than One third of total number of subjects at the Semester III & Semester IV Examinations of B. Pharm. in accordance with O B. Pharm.3.4:

c) No candidate will be admitted to the Semester VII course of B. Pharm. unless he/she

i) Passes his/her Semester I & Semester II., Semester III & Semester IV., Semester V & Semester VI
Examinations of B. Pharm. examinations,

OR

ii) passes his/her Semester I & Semester II., Semester III & Semester IV Examinations of B. Pharm. and
fails in not more than One third of total number of subjects at the Semester V & Semester VI Examinations of B. Pharm. in accordance with O B. Pharm.3.4:

Allowed to Keep Terms (ATKT) rules.

Number of subjects: ATKT will be awarded to those who have failed in 1/3 subject head (33%) as described in table **given** below

At the end of academic year		Total subject heads at the end of academic year.	33 % of total subjects (To nearest full digit) for ATKT
First	Theory	05+06=11	4
	Practical	04+04=08	3
Second	Theory	06+06=12	4
	Practical	05+05=10	3
Third	Theory	05+05=10	3
	Practical	05+04=09	3

O B. Pharm. 4 Marks, Criteria for passing and other conditions.

O B. Pharm. 4.1 Passing criteria for each subject head:

Maximum marks for each subject head and the minimum marks for passing in each of the subject head –See Examination scheme given in Annexure.
No separate passing is required for periodic test and if the candidate remains absent for the test, the candidate will be just treated as not appeared for the test securing zero marks. What so ever mark obtained by the candidate will be added to the marks obtained by the candidate in University examination as shown in scheme of examination given in Annexure.

In no circumstance previous marks will be considered. If a candidate's application form for reappearing in the examination in a subject head is accepted, and the candidate appear in the examination (Periodic test & Semester examination) fresh marks will be considered.

O B. Pharm.4.2 Passing of the semester.

Candidate will be considered as passed the semester only when the candidate passes in the entire subject heads and obtains overall a minimum of 50% of the total aggregate marks prescribed for the semester see Annexure.

O B .Pharm. 4.3 Award of the degree and Class.

Degree will be awarded to the candidates who have passed all the eight semesters.

Class will be awarded on the basis of combined marks at the Semester-V to Semester VIII.

1. Those obtaining 50 per cent & above but below 60 per cent of the total marks Second class per cent of the total marks
2. Those obtaining 60 per cent & above but below 70 First Class. per cent of the total marks
3. Those obtaining 70 per cent of the total marks or above and First Class with Distinction.

A student will be allowed to improve his/her class at B. Pharm. by reappearing for the subjects (maximum 3 theory subjects of that examination) from V or/and VIII Semesters of B. Pharm. Course as per prevalent policy of University.

O B. Pharm. 4.4 With holding of results.

A candidate's result will be with held under the following situations and of the respective Semester.

1. Withholding of result for not fulfilling passing criteria for advancement to subsequent classes-

Result of Semester IV will be with held if the candidate has not passed Semester–I and Semester II.

Result of Semester VI will be with held if the candidate has not passed Semester–III and Semester – IV.

Result of Semester VIII will be with held if the candidate has not passed Semester- V& Semester-VI.

2. Withholding of result for failure to comply University rules-

The result of candidate shall be withhold if the candidate found guilty in malpractices during examinations and any other failure to comply University rules and regulation as confirmed by appropriate body of University.

O B. Pharm. 4.6 Exemption to appear for the examination:

If a candidate has got ATKT, the candidate will be exempted for appearing the examination for those subject heads in which the candidate has passed.

Any candidate who has passed in any subjects head is exempted for appearing the examination in that subject head.

Notwithstanding above if a candidate has passed in all the subjects but failed due to not getting 50% of the aggregate marks may appear for the examination in any three theory subject heads the candidate desires so as to get over all 50% marks. In such cases, Higher marks obtained in the subject heads, the candidate has appeared for the fresh examination and the marks obtained in the previous examination of the same subject will only be considered irrespective of the examination and fresh result will be declared. For example if the candidate gets over all 50% marks but fails in one of the subject heads in which the candidate had passed earlier, the candidate will be treated as passed in that subject head as per previous examination and result will be declared as per the rules applicable to the passed candidates. The marks in which the candidate has not appeared for the examination will be carried forward.

O B. Pharm. 4.7 Every candidate shall be required to work for at least four weeks in a Pharmaceutical Industry after the Semester- IV of the course of study, and shall submit satisfactory report of such work to the head of the institute. The candidate should also submit one copy to the University for the Award of Degree along with convocation form. The candidate may undergo practical training in parts, each constituting not less than two weeks.

O B. Pharm. 4.8 The Detailed Scheme of Examination & Syllabus for each semester-See Annexure.

The pattern for University theory examination question paper shall be as given below:

Scheme for theory Examination: - Each Theory paper should be divided in 2 sections which should be attempted in separate answer sheet.

Sr. No.	Head	Marks distribution
Section – I		
Q.1.	Small Questions-Reasoning, Definition, Structures, Justifications, Diagram etc. (Note: True false, match the pairs, fill in the blanks, MCQ should not be asked)	10 (2 mark x 5 Qs, out of 7 Qs.)
Q.2	Short answers type questions – 5 marks	20 (5 mark x 4 Qs, out of 6 Qs.)
Q.3	Long answers questions	10 (10 mark x 1 Qs, out of 2 Qs.
Section – II		
Q.4	Small Questions-Reasoning, Definition structures, Justifications, diagram etc. (Note: true false, match the pairs, fill in the blanks, MCQ should not be asked)	10 (2 mark x 5 Qs, out of 7 Qs.)
Q.5	Short answers type questions – 5 marks	20 (5 mark x 4 Qs, out of 6 Qs.)
Q.6	Long answers questions	10 (10 mark x 1 Qs, out of 2 Qs.)
	Total maximum marks of section I and II	80
	Duration of examination	3 Hrs.

Scheme for University Examination

Sr. No.	Head	Marks distribution
1	Spotting/ Identification(If spotting/Identification is not applicable to any subject, marks will be included in Major & Minor Experiment)	10
2	Synopsis	10
3	Major experiment	35
4	Minor experiment	15
5	Viva	10
	Total Marks	80
	Duration	04 Hrs.

Scheme for Practical Sessional Examination

Sr. No.	Head	Marks distribution
1	Attendance	08
2	Viva	04
3	Lab Record and Performance	08
	Total Marks	20
	Duration	03 Hrs.

Subject Semester 1

Subject Code	Subject	Workload
T.1.1.1.	Pharmaceutics-I(Dispensing Pharmacy)	4
P.1.1.1.	Pharmaceutics-I(Dispensing Pharmacy)	3
T.1.1.2.	Pharmacognosy-I	3
P.1.1.2.	Pharmacognosy-I	3
T.1.1.3.	Pharmaceutical Chemistry-I (Inorg. Pharm. Chemistry)	3
P.1.1.3.	Pharmaceutical Chemistry-I (Inorg. Pharm. Chemistry)	3
T.1.1.4.	Applied Biostatistics & Computer Applications in Pharmacy	4
P.1.1.4.	Applied Biostatistics & Computer Applications in Pharmacy	3
T.1.1.5.	Communicating Skills and soft skill development	4
Total		Th 18/Pr 12

Semester II

Subject Code	Subject	Workload
T 1.2.1.	Pharmaceutics -II(Unit operation)	4
P 1.2.1.	Pharmaceutics -II(Unit operation)	3
T 1.2.2.	Pharmaceutical Chemistry -II(Inorganic & Physical Chemistry)	3
P 1.2.2.	Pharmaceutical Chemistry -II(Inorganic & Physical Chemistry)	3
T 1.2.3.	Pharmaceutical Chemistry-III(Organic Chemistry-I)	4
P 1.2.3.	Pharmaceutical Chemistry-III(Organic Chemistry-I)	3
T 1.2.4.	Anatomy, Physiology & Health Education (APHE) – I	4
P 1.2.4.	Anatomy, Physiology & Health Education (APHE) – I	3
T 1.2.5.	Industrial Psychology	3
5555	Environmental Science	3
Total		Th 18/Pr 12

Semester III

Subject Code	Subject	Workload
T 2.3.1	Pharmaceutics -III (I Physical Pharmacy-I)	3
P 2.3.1	Pharmaceutics -III (I Physical Pharmacy-I)	3
T 2.32.	Pharmaceutical Chemistry-IV (Organic Chemistry - II)	3
P 2.32.	Pharmaceutical Chemistry-IV (Organic Chemistry - II)	3
T 2.3.3.	Pharmacognosy –II	3
P 2.3.3.	Pharmacognosy –II	3
T 2.3.4.	Pharmaceutical Analysis – I	3
P 2.3.4.	Pharmaceutical Analysis – I	3
T 2.3.5	A P HE-II	3
P 2.3.5	A P HE-II	3
T.2.3.6	Pathophysiology of Common Diseases-I	3
		Th 18/Pr15

Semester IV

Subject Code	Subject	Workload
T.2.4.1.	Pharmaceutics – IV (Physical Pharmacy-II)	3
P.2.4.1.	Pharmaceutics – IV (Physical Pharmacy -II)	3
T.2.42.	Pharmaceutical Microbiology	3
P.2.42.	Pharmaceutical Microbiology	3
T.2.4.3.	Pharmacognosy – III	3
P.2.4.3.	Pharmacognosy – III	3
T.2.4.4.	Pharmaceutics –V (Hospital Pharmacy)	3
P.2.4.4.	Pharmaceutics –V (Hospital Pharmacy)	3
T 2.4.5.	Pharmaceutical Chemistry - V(Biochemistry)	3
P 2.4.5.	Pharmaceutical Chemistry - V(Biochemistry)	3
T.2.4.6.	Pathophysiology of Common Diseases-II	3
		Th 18/Pr 15

Semester V

Subject Code	Subject	Workload
T 3.5.1.	Pharmaceutical Chemistry - VI (Medicinal Chemistry - I)	4
P 3.5.1.	Pharmaceutical Chemistry - VI (Medicinal Chemistry - I)	3
T 3.5.2.	Pharmaceutics - VI (Pharmaceutical Technology I)	4
P 3.5.2.	Pharmaceutics - VI (Pharmaceutical Technology I)	3
T 3.5.3.	Pharmacology – I	4
P 3.5.3.	Pharmacology – I	3
T 3.5.4.	Pharmacognosy –IV	3
P 3.5.4.	Pharmacognosy –IV	3
T 3.5.5.	Pharmaceutical Analysis-II	3
P 3.5.5.	Pharmaceutical Analysis-II	3
Total		Th 18/Pr 15

Semester VI

Subject Code	Subject	Th
T 3.6.1.	Pharmaceutical Chemistry - VII (Medicinal Chemistry -II)	4
P 3.6.1.	Pharmaceutical Chemistry - VII (Medicinal Chemistry - II)	3
T 3.6.2.	Pharmaceutics -VII(Biopharmaceutics & Pharmacokinetics)	3
P 3.6.2.	Pharmaceutics -VII(Biopharmaceutics & Pharmacokinetics)	3
T 3.6.3.	Pharmacology –II	4
P 3.6.3.	Pharmacology –II	3
T 3.6.4.	Pharmacognosy - V (Chemistry of Natural Products)	3
P 3.6.4.	Pharmacognosy - V (Chemistry of Natural Products)	3
T 3.6.5.	Pharmaceutical Jurisprudence & Ethics	4
P 3.6.6	Project report	
		Th 18/Pr 12

Compulsory Industrial Training of Four Weeks with Component of Evaluation after Completion of IV Semester

Semester VII

Subject Code	Subject	Workload
T 4.7.1.	Pharmaceutics – VIII (Pharmaceutical Technology - II)	3
P 4.7.1.	Pharmaceutics – VIII (Pharmaceutical Technology - II)	3
T 4.7.2.	Pharmaceutical Chemistry _ VIII(Medicinal Chemistry - III	3
P 4.7.2.	Pharmaceutical Chemistry _ VIII(Medicinal Chemistry - III	3
T 4.7.3.	Pharmacology –III	3
P 4.7.3.	Pharmacology –III	3
T 4.7.4.	Pharmaceutical Analysis – III	3
P 4.7.4.	Pharmaceutical Analysis – III	3
T 4.7.5.	Pharmaceutical Biotechnology	3
T 4.7.6.	Pharmaceutical Industrial Management	3
		Th 18/Pr12

Semester VIII

Subject Code	Subject	Workload
T 4.8.1.	Pharmaceutics – IX	3
P 4.8.1.	Pharmaceutics – IX	3
T 4.8.2.	Pharmaceutical Analysis – IV	3
P 4.8.2.	Pharmaceutical Analysis – IV	3
T 4.8.3.	Pharmaceutical Chemistry –IX (Medicinal Chemistry- IV)	3
P 4.8.3.	Pharmaceutical Chemistry – IX (Medicinal Chemistry- IV)	3
T 4.8.4.	Pharmacognosy – VI	3
P 4.8.4.	Pharmacognosy – VI	3
T 4.8.5.	Pharmacology - IV (Clinical Pharmacy & Drug Interactions)	3
T 4.8.6.	Elective (Theory)	3
P 4.8.7.	Industrial training report	-
		Th 18/Pr 12

* Elective subjects
1. Pharm. Marketing
2. Medicinal Plant Biotechnology
3. Quality Assurance
4. Drug Design and Lead Identification
5. Bioavailability and TDM
6. Cosmeceutics
7. Packaging Technology
8. Any other emerging area availing local expertise of Pharmaceutical relevance.

Annexure

Scheme of Examination for eight semesters of B. Pharm. Course Name and number of heads of passing, number of paper, duration of examination, maximum marks, minimum marks for passing, periodic tests, duration, maximum marks.

Semester-I

Teaching Scheme				Examination Scheme						
Sub Code	Subject	No. of Papers	Teaching Scheme	Semester Examination			Periodic tests		Total Maximum Marks for subject	Minimum marks for passing subject
				Duration (Hours)	Maximum marks	Min for passing	Duration Hours	Maximum marks		
T1.1.1.	Pharmaceutics-I(Dispensing Pharmacy)	1	4	3	80	32	1	20	100	40
P1.1.1	Pharmaceutics-I(Dispensing Pharmacy)	1	3	4	80	32	---	20	100	40
T1.1.2.	Pharmacognosy-I	1	3	3	80	32	1	20	100	40
P1.1.2	Pharmacognosy-I	1	3	4	80	32	---	20	100	40
T1.1.3	Pharmaceutical Chemistry-I (Inorganic Pharmaceutical Chemistry)	1	3	3	80	32	1	20	100	40
P1.1.3.	Pharmaceutical Chemistry-I (Inorganic Pharmaceutical Chemistry)	1	3	4	80	32	---	20	100	40
T1.1.4	Applied Biostatistics & Computer Applications Pharmacy	1	4	3	80	32	1	20	100	40
P1.1.4	Applied Biostatistics & Computer Applications Pharmacy	1	3	4	80	32	---	20	100	40
T1.1.5	Communicating skills & soft Skills development	1	4	3	80	32	1	20	100	40
Total		TH-18 / PR-12								

Semester-II

Teaching Scheme				Examination Scheme						
Sub Code	**Subject**	**No. of Papers**	**Teaching Scheme**	**Semester Examination**			**Periodic tests**		**Total Maximum subject**	**Minimum for passing subject**
				Duration (Hours)	**Maximum marks**	**Min for passing**	**Duration Hours**	**Maximum marks**		
T 1.2.1.	Pharmaceutics -II(Unit Operation)	1	4	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 1.2.1.	Pharmaceutics -II(Unit Operation)	1	3	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 1.2.2	Pharmaceutical Chemistry –II (Inorganic & Physical Chemistry)	1	3	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 1.2.2.	Pharmaceutical Chemistry –II (Inorganic & Physical Chemistry)	1	3	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 1.2.3	Pharmaceutical Chemistry-III (Organic Chemistry-I)	1	4	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 1.2.3.	Pharmaceutical Chemistry-III (Organic Chemistry-I)	1	3	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 1.2.4	Anatomy, Physiology & Health Education (APHE) – I	1	4	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 1.2.4.	Anatomy, Physiology & Health Education (APHE) – I	1	3	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 1.2.5	Industrial Psychology	1	3	**3**	**80**	**32**	**1**	**20**	**100**	**40**
5555	Environmental Science	1	3	**3**	**80**	**32**	**--**	**20**	**100**	**40**
TOTAL-				**TH-18 / PR-12**						

Semester-III

Teaching Scheme				Examination Scheme						
Sub Code	**Subject**	**No. of Papers**	**Teaching Scheme**	**Semester Examination**			**Periodic tests**		**Total Maximum subject**	**Minimum for passing subject**
				Duration (Hours)	**Maximum marks**	**Min for passing**	**Duration Hours**	**Maximum marks**		
T 2.3.1	Pharmaceutics-III (Physical Pharmacy-I)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 2.3.1	Pharmaceutics-III (Physical Pharmacy-I)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 2.3.2.	Pharmaceutical Chemistry-IV (Organic Chemistry - II)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 2.3.2.	Pharmaceutical Chemistry-IV (Organic Chemistry - II)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 2.3.3.	Pharmacognosy –II	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 2.3.3.	Pharmacognosy –II	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 2.3.4.	Pharmaceutical Analysis – I	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 2.3.4.	Pharmaceutical Analysis – I	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 2.3.5	A P H E-II	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 2.3.5	A P H E-II	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 2.3.6	Pathophysiology of Common Diseases-I	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
TOTAL--							Th 18 / Pr 15			

Semester-IV

Teaching Scheme				Examination Scheme						
Sub Code	**Subject**	**No. of Papers**	**Teaching Scheme**	**Semester Examination**			**Periodic tests**		**Total Maximum subject**	**Minimum for passing subject**
				Duration (Hours)	**Maximum marks**	**Min for passing**	**Duration Hours**	**Maximum marks**		
T.2.4.1.	Pharmaceutics – IV((Physical Pharmacy-II)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P.2.4.1.	Pharmaceutics – IV((Physical Pharmacy-II)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T.2.4.2.	Pharmaceutical Microbiology	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P.2.4.2.	Pharmaceutical Microbiology	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T.2.4.3.	Pharmacognosy – III	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P.2.4.3.	Pharmacognosy – III	**1**	**4**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T.2.4.4.	Pharmaceutics –V (Hospital Pharmacy)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P.2.4.4.	Pharmaceutics –V (Hospital Pharmacy)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T.2.4.5.	Pharmaceutical Chemistry – V (Biochemistry)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P.2.4.5.	Pharmaceutical Chemistry – V (Biochemistry)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T.2.4.6.	Pathophysiology of Common Diseases-II	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
TOTAL--							Th 18 / Pr 15			

Semester V

Teaching Scheme				Examination Scheme						
Sub Code	**Subject**	**No. of Papers**	**Teaching Scheme**	**Semester Examination**			**Periodic tests**		**Total Maximum subject**	**Minimum for passing subject**
				Duration (Hours)	**Maximum marks**	**Min for passing**	**Duration Hours**	**Maximum marks**		
T 3.5.1.	Pharmaceutical Chemistry – VI (Medicinal Chemistry - I)	**1**	**4**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.5.1.	Pharmaceutical Chemistry – VI (Medicinal Chemistry - I)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 3.5.2.	Pharmaceutics – VI (Pharmaceutical Technology I)	**1**	**4**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.5.2.	Pharmaceutics – VI (Pharmaceutical Technology I)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 3.5.3.	Pharmacology – I	**1**	**4**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.5.3.	Pharmacology – I	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 3.5.4.	Pharmacognosy –IV	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.5.4.	Pharmacognosy –IV	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 3.5.5.	Pharmaceutical Analysis-II	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.5.5.	Pharmaceutical Analysis-II	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
TOTAL--							Th 18 / Pr 15			

Semester-VI

Teaching Scheme				Examination Scheme						
Sub Code	**Subject**	**No. of Papers**	**Teaching Scheme**	**Semester Examination**			**Periodic tests**		**Total Maximum subject**	**Minimum for passing subject**
				Duration (Hours)	**Maximum marks**	**Min for passing**	**Duration Hours**	**Maximum marks**		
T 3.6.1.	Pharmaceutical Chemistry - VII (Medicinal Chemistry -II)	**1**	**4**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.6.1.	Pharmaceutical Chemistry – VII (Medicinal Chemistry - II)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 3.6.2.	Pharmaceutics –VII (Bio pharmaceutics & Pharmacokinetics)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P. 3.6.2.	Pharmaceutics –VII (Bio pharmaceutics & Pharmacokinetics)	**1**	**3**	**3**	**80**	**32**	**----**	**20**	**100**	**40**
T. 3.6.3.	Pharmacology –II	**1**	**4**	**4**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.6.3.	Pharmacology –II	**1**	**3**	**3**	**80**	**32**	**---**	**20**	**100**	**40**
T 3.6.4.	Pharmacognosy - V (Chemistry of Natural Products)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 3.6.4.	Pharmacognosy - V (Chemistry of Natural Products)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 3.6.5.	Pharmaceutical Jurisprudence & Ethics	**1**	**4**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P.3.6.6	Project Report	**Grade A/B/C**								
Total							Th 18 / Pr 12			

Semester-VII

Teaching Scheme				Examination Scheme						
Sub Code	**Subject**	**No. of Papers**	**Teaching Scheme**	**Semester Examination**			**Periodic tests**		**Total Maximum subject**	**Minimum for passing subject**
				Duration (Hours)	**Maximum marks**	**Min for passing**	**Duration Hours**	**Maximum marks**		
T 4.7.1.	Pharmaceutics – VIII (Pharmaceutical Technology - II)	**1**	**3**	**4**	**80**	**32**	**1**	**20**	**100**	**40**
P. 4.7.1.	Pharmaceutics – VIII (Pharmaceutical Technology - II)	**1**	**3**	**3**	**80**	**32**	**----**	**20**	**100**	**40**
T 4.7.2.	Pharmaceutical Chemistry- VIII (Medicinal Chemistry – III)	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 4.7.2	Pharmaceutical Chemistry-VIII (Medicinal Chemistry – III)	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 4.7.3.	Pharmacology –III	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P 4.7.3.	Pharmacology –III	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T.4.7.4.	Pharmaceutical Analysis-III	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
P.4.7.4.	Pharmaceutical Analysis-III	**1**	**3**	**4**	**80**	**32**	**---**	**20**	**100**	**40**
T 4.7.5.	Pharmaceutical Biotechnology	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
T 4.7.6.	Pharmaceutical Industrial Management	**1**	**3**	**3**	**80**	**32**	**1**	**20**	**100**	**40**
TOTAL--							Th 18/ Pr 12			

Semester-VIII

Teaching Scheme				Examination Scheme						
Sub Code	Subject	No. of Papers	Teaching Scheme	Semester Examination			Periodic tests		Total Maximum subject	Minimum for passing subject
				Duration (Hours)	Maximum marks	Min for passing	Duration Hours	Maximum marks		
T 4.8. 1.	Pharmaceutics – IX	1	3	3	80	32	1	20	100	40
P 4.8. 1.	Pharmaceutics – IX	1	3	4	80	32	---	20	100	40
T 4.8.2.	Pharmaceutical Analysis – IV	1	3	3	80	32	1	20	100	40
P 4.8.2.	Pharmaceutical Analysis – IV	1	3	4	80	32	---	20	100	40
T 4.8.3.	Pharmaceutical Chemistry –IX (Medicinal Chemistry- IV)	1	3	3	80	32	1	20	100	40
P 4.8.3.	Pharmaceutical Chemistry – IX (Medicinal Chemistry- IV)	1	3	4	80	32	---	20	100	40
T 4.8.4.	Pharmacognosy – VI	1	3	3	80	32	1	20	100	40
P. 4.8.4.	Pharmacognosy – VI	1	3	4	80	32	---	20	100	40
T.4.8.5.	Pharmacology - IV (Clinical Pharmacy & Drug Interactions)	1	3	3	80	32	1	20	100	40
T.4.8.6.	Elective(Theory)	1	3	3	80	32	1	20	100	40
P.4.8.7.	Industrial training report	Grade A/B/C								
TOTAL--							Th 18 Pr 12			

Industrial Training Report & Project Report grade will be awarded as follow

Grade A : Excellent
Grade B : Good
Grade C : Poor

***Above both the report can be completed during T.Y. / Final B. Pharm.**

For project report one project should be given in group of 3 Students. Under one teacher. 5-7 group can study and complete their project. During final Year (VIII Sem.) oral examination will be conducted by appointing External Examiner from Industry or Academic for both the project and grades will be allotted individually.

* Elective subjects
1. Pharm. Marketing
2. Medicinal Plant Biotechnology
3. Quality Assurance
4. Drug Design and Lead Identification
5. Bioavailability and TDM
6. Cosmeceutics
7. Packaging Technology
8. Any other emerging area availing local expertise of Pharmaceutical relevance.

T.1.1.1 – Pharmaceutics-I (Dispensing Pharmacy)
(Theory 4hours/week)
Section I

	Topics	Hrs.
1	**Introduction to dosage form**	3
	Pharmacist: A Health Care Provider: Pharmacy education, role of pharmacist, pharmacy practice in India, pharmaceutical healthcare, role of community pharmacist.	
2	**Pharmaceutical Additives**	3
3	**Prescription:** Introduction, parts of prescription, handling of prescription, patient counseling, types of prescription, prescription pricing and documentation.	5
4	**Compounding and Dispensing of Medication:** Definition of compounding, dispensing and manufacturing. Fundamental operations in compounding, containers and closures for dispensed products, labeling and storage of compounded products. Good compounding practices, good dispensing practices, record keeping, PMR, product information leaflet, medication card, pictograms.	5
5	**Pharmaceutical Calculations:** Weights and measures, % calculations, allegation method, proof spirit, isotonicity.	4
6	**Posology:** Introduction, factors affecting dose, calculation of doses according to age, body weight and surface area.	2
7	**Pharmaceutical Incompatibility:** Definition, introduction, classification. Physical incompatibility, chemical incompatibility and therapeutic incompatibility.	4
		23

Section II

	Topics	Hrs.
1	**Suspension:** Introduction, classification, advantages, disadvantages, formulation, compounding and dispensing aspects of suspension. Oral suspensions, dry powders for suspension, inhalations and topical suspensions.	5
2	**Emulsion:** Introduction, classification, applications of emulsion. Formulation, emulsifying agents, selection of emulsifying agents, HLB values, compounding of emulsion (bottle method, wet gum and dry gum method), identification of type of emulsion, stability and causes of instability of emulsion (cracking, creaming and phase inversion). Oral and topical emulsion.	5
3	**Semisolids:** Ointments, classification, advantages, disadvantages, formulation, ointment bases, compounding of ointments (incorporation, fusion and dilution method). Creams, definition and uses, formulation, compounding and filling. Pastes, definition and uses, formulation and compounding. Gel and Jellies, definition and uses, types of gel, compounding of gels. Poultices and Plasters, definition and uses, formulation and compounding.	5
4	**Suppositories:** Introduction, classification, merits and limitations. Formulation of suppositories, oleaginous base, hydrophilic base, compounding of suppositories by moulding, hand rolling and compression. (evaluation parameters shall not be included)	3
5	**Ligatures and Sutures:** Introduction, classification, absorbable and non-absorbable sutures. Processing, manufacturing, packaging and quality control test of catgut.	2
6	**Monophasic liquid dosage forms**	7
7	**Powders and granules**	3
8	**Introduction to Pharmacopoeias and other Compendia:** IP, BP, USP, BPC, extra pharmacopoeia and European pharmacopoeia	2
		22

P.1.1.1 Dispensing Pharmacy
(Practical) (3 hrs/week)

A. Introduction to Laboratory Apparatus.

B. Introduction to Weights and Measures.

C. Introduction to Latin Terms Abbreviations.

D. Handling of Prescription.

E. Suspensions

1. Pediatric Kaolin Mixture*.
2. Magnesium Trisillicate Mixture*.
3. Pediatric Chalk Mixture**.
4. Menthol and Eucalyptus Inhalation*.
5. Calamine Lotion*.

F. Emulsions

1. Castor Oil Emulsion*.
2. Turpentine Liniment**.
3. Oily Calamine Lotion**.
4. Benzyl Benzoate Application*.

G. Ointments/Paste/Gel

1. Sulphur Ointment*.
2. Benzoic Acid Ointment (Whitfield's Ointment) **.
3. Methyl Salicylate Ointment**.
4. Zinc Oxide and Salicylic Acid Paste (Lassar's Paste) **.
5. Resorcinol and Sulphur Paste*.
6. Lubricating Gel*.

H. Suppositories

1. Use of Displacement Value*.
2. Suppository with Fatty Base**.
3. Suppository with PEG Base**.
4. Glycerin Suppositories**.

* **Indicates Minor Experiments** ** **Indicates Major Experiment**

T. 1.1.2 - Pharmacognosy– I

(Theory)(3 hours/week)

Section I

Topics		Hrs.
1	Definition, history, scope and development of Pharmacognosy	03
2	Sources of drugs :Biological, marine, mineral and plant tissue cultures as sources of drugs	02
3	Classification of drugs : Alphabetical, morphological, taxonomical, chemical and pharmacological classification of drugs	03
4	Plant taxonomy : study of the following families with special reference to medicinally important plants - Apocynacae, Solanaceae, Rutacease, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae, Papaveraceae.	07
5	Cultivation, Collection, Processing and storage of crude drugs: Factors influencing cultivation of medicinal plants. Types of soils and fertilizers of common use. Pest management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.	08
	TOTAL	**23**

Section II

Topics		Hrs.
1	Quality control of crude drugs: Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods and properties.	06
2	An introduction to active constituents of drugs: their isolation, classification and properties.	04
3	Systematic pharmacognostic study of following a) Carbohydrates and derived products: agar, guar gum, acacia, Honey, Isabgol, pectin, Starch, sterculia and Tragacantyh. b) Lipids: Bees wax, Castor oil, Cocoa butter, Cod~liver oil, Hydnocarpus oil, Kokum butter, Lard, Linseed oil, Rice, Bran oil, Shark liver oil and Wool fat.	12
	TOTAL	**22**

P. 1.1.2 - Pharmacognosy– I

(Practical) (3 hours/week)

1. Morphological characteristics of plant families mentioned in theory.**
2. Microscopic measurements of cells and Cell contents: Starch grains, calcium oxalate crystals and phloem fibers.*
3. Determination of leaf constants such as stomatal index, stomatal number, vein-islet number, vein-termination number and palisade ratio.**
4. Identification of crude drugs belonging to carbohydrates and lipids.*
5. Preparation of herbarium sheets.*

Indicates Minor Experiments** * **Indicates Major Experiment**

Books Recommended:

1. Kokate C. K. Purohit A. P. and Gokhale S. B., Pharmacognosy (degree), Nirali Prakashan
2.Kokate C.K., Practical Pharmacognosy, Vallabh Prakashan, Delhi
3. Atal C. K. and Kapur B. M., Cultivation and utilization of Medicinal plants, RRL, Jammu.
4. Brain K. R. and Turner T. D., The practical Evaluation of phytopharmaceuticals
5. Khandelwal KR, Practical Pharmacognosy, Nirali Prakashan, Pune.
6. Chandha K.L. and Gupta R., Advances in Horticulture, Vol II, medicinal and aromatic plants
7. Chopra R. N., Nayar S. L. and Chopra I. C., Glossary of Indian Medicinal plants CSIR, New Delhi.
8. Iyengar M.A., Study of Crude Drugs, Manipal Power Press, Manipal.
9. Iyengar M.A. , Pharmacognosy Lab Manual., Manipal Power Press, Manipal.
10. Medicinal Plants of India, Zafar R., C.B.S. Publisher, New Delhi.
11. Swain T., Chemical Plant Taxonomy, Academic Press London.
12. Swain T., Comparative Phytochemistry, Academic Press London.
13. The Wealth of India, Raw Marerials (All Volumes), Council of Scientific and Industrial Research,
14. Trease, G.E. and Evans, W.C. Pharmacognosy, 12th Edition, Bailliere Tindall, Eastbourne.
15. Siddiqui A.A. and Siddiqui Seemi, Natural products chemistry practical manual, CBS Publishers and Distributors Pvt Ltd.
16. Whistler R.L., Industrial Gums, Polysaccharides and their derivatives, 2nd Edition, Academic Press,
17. Tyler, V.E., Brady, R., Pharmacognosy, Lea and Febiger, London.
18. Wagner, S.B., Zgainsky, Plant drug Analysis, Springer, Second edition.
19. A.C.Dutta, A Class Book of Botany, Seventeenth edition, Oxford university press
20. V.D.Rangari, Pharmacognosy and Phytochemistry, Volume I & II
21. Fahn A, Plant anatomy, 3rd Ed. Pergamon press, Oxford.
22. Mohammed Ali, Textbook of Pharmacognosy, Second edition, CBS Publishers and Distributors Pvt Ltd.
23. Wallis, T.E. Textbook of Pharmacognosy, J.A. Churchill Limited, London.

T. 1.1.3 - Pharmaceutical Chemistry - I (Inorganic Pharmaceutical Chemistry) (Theory)(3 hours/week)

Section I

Topics		Hrs.
1.	**Purity of pharmaceuticals:** sources of impurities, tests for purity and identity, including limit tests for iron, arsenic, heavy metals(lead), chloride, sulphate and special tests if any, of the following classes of inorganic pharmaceuticals included in Indian Pharmacopoeia.	07
2.	**Acids, Bases and Buffers :**Theories of acid and base, Types of pharmaceutical buffers, mechanism of action, Buffer equation, Buffer capacity, Measurement of tonicity, Calculations and methods of adjusting isotonicity.	08
3.	**Water:** Types ,physical and chemical properties of water, methods of softening of water	03
4.	**Gastrointestinal Agents:** Acidifying agents, Antacids, ProtectivesandAdsorbents, Saline Cathartics.	05
	TOTAL	**23**

Section II

Topics		Hrs.
5	**Major Intra-and Extra-cellular Electrolytes:** Physiological ions. Electrolytes usedfor replacement therapy, acid-base balance and combination therapy.	07
6	**Essential and Trace Elements:** Transition elements and their compounds ofpharmaceutical importance: Iron and haematinics, mineral supplements.	08
7	**Cationic and anionic components** of inorganic drugs useful for systemic effects.	03
8	Gases and Vapours: Oxygen, Anesthetics and Respiratory stimulants.	04
	TOTAL	**22**

P.1.1.3 - Pharmaceutical Chemistry – I (Inorganic Pharmaceutical Chemistry) (Practical)) (3 hours/week)

Sr.no.	Topic	No. of experiments
1	systematic qualitative analysis of inorganic mixtures containing two anions and two cations**	minimum five practicals
2	Limit test for the following as per the procedure given in Indian pharmacopoeia: • Chloride* • Sulphate* • Heavy metals* • Iron* • Arsenic**	At least one for each
3	Preparation of inorganic compounds:* • Copper sulphate • Magnesium oxide • Ferrous sulphate	Minimum 2

Indicates Minor Experiments** * Indicates Major Experiment**

Books Recommended:

1. Vogel's Textbooks of qualitative Inorganic Analysis By Denny, Jeffery.
2. Practical Pharmaceutical inorganic chemistry, By Beckett & Stenlake.
3. Inorganic Medicinal & Pharmaceutical Chemistry By Block & Roche.
4. Text book of Pharmaceutical Chemistry, By Chatten L.G.(Dekker series).
5. Textbook of Pharmaceutical analysis By Connors K.A.
6. Text book of Pharmaceutical analysis By Dr. H. N. More.
7. Indian Pharmacopoeia.
8. British Pharmacopoeia.
9. Remington's Pharmaceutical Sciences.
10. Textbook of Inorganic pharmaceutical chemistry By Siddique.
11. Textbook of Inorganic pharmaceutical chemistry By Dr. K.G.Bothara.
12. Textbook of Inorganic pharmaceutical chemistry By Dr. Kasture and Wadodkar.
13. Textbook of Inorganic pharmaceutical chemistry By Dr. Kasture and Wadodkar.

T.1.1.4. Biostatistics And Computer Application in Pharmacy

Theory (4 hrs/ week)

Section-I

TOPICS	Hrs.
1. Introduction to Statistics :Meaning of statistics, uses and limitation of Statistics. Collection of data, Classification of raw data into ungrouped and grouped frequency distribution, Representation of data by diagram and multiple bar diagram, simple bar diagram and pie diagram. Representation of data by graph : Histogram, frequency polygram. Statistical population, meaning of sample, Introduction of sampling, simple random sampling, stratified random sampling, systematic sampling.	6
2. Measures of central tendency- A.M. G. M. and H. M., mean, mode, median, Measures of dispersion-Range, quartile range, mean deviation, variance and standard deviation, Coefficient of variance.	6
3. Bivariate data, correlation, scatter diagram, karl pearson's coefficient of correlation, spearman's rank correlation, Regression, line of regression, method of least square, non linear regression, Analysis of variance, one way and two way classification.	6
4. Probability and Probability distribution- Meaning of classical probability, Axiomatic approach to probability, probability theorem, Binomial distribution, normal probability distribution.	6
5. Testing of Hypothesis – Null hypothesis, alternative hypothesis, parameter statistics, testing of significance, standard error, critical region, acceptance region, one tailed and two tailed test. Type I and Type II error.	6

Section-II

TOPICS	Hrs.
1. History and Generation of Computers Fundamentals, evolution and generation, types of computers	4
2. Anatomy and Computer Peripherals CPU, Input and Output devices, Ancillary machines, characteristics of computers, memories and storage devices	6
3. Operating systems Terminology MS-DOS, MS Windows, Introduction to other operating systems.	4
4. Microsoft office MS Word, MS Excel, MS PowerPoint	10
5. Introduction to internet basics and networking Internet browsing, search engines, e-mail networking concepts, LAN, WAN.	3

6. Computer applications in pharmacy Applications to pharmacokinetics, drug design, hospital and clinical pharmacy, pharmaceutical analysis, crude drug identification, diagnosis and data analysis, bulk drug and pharmaceutical manufacturing, sales and marketing.	3

P.1.1.4. Biostatistics And Computer Application in Pharmacy

Practical (3 hrs/ week)

Exercises based on the following are to be dealt:

1. Computer operating systems like MS DOS, MS WINDOWS etc.
2. Study of soft-ware packages like MS Word, MS Excel, MS PowerPoint etc.
3. Browsing of Internet.

Reference Books:

1. Introduction to Biostatics and Computer science by Y. I. Shah, Dr. A. R. Paradkar, and M. G. Dhaygude, Nirali Prakashan, Pune – 02
2. Methods of Biostatics for Medical and Research students by B. K. Mahajan, Jaypee brothers medical publishers (P) Ltd., New Delhi – 02
3. Fundamentals of Applied statistics by S. C. Gupta, V. K. Kapoor, Sultan Chand and Sons Publishers New Delhi – 02
4. Applied Statistics by S. P. Gupta and Kapoor Sultan Chand and Sons Publishers, New Delhi – 02
5. Pharmaceutical Statistics by S. Boton
6. Donald Sanders - Computer Today (3 rd Edition) Publisher – McGraw - Hill Book Company
7. William and Fassett - Computer Applications in Pharmacy.
8. Computer-Aided Drug Design (Methods & Applications) Edited by - Thomas Perun, Propst Publisher- Marcel Dekker Inc.
9. Computer Medicine by J. Rose, Publisher: J. & A. Churchill Ltd.
10. Computer Programming - I by Sneha Phadke, Publisher: Technova Publication
11. Microsoft office 97 by Ginicourter & Annette Marquis, BPB Publications, N. Delhi – 01
12. The ABC's of the Internet by Cristain Crumlish, BPB Publications, N. Delhi –

T.1.1.5. Communicating Skills and soft skill development

(Theory 4 Hours/week)

Section – I

Topics	Hrs
1) **Introduction on language and communication:** Meaning and importance of communication, Objectives of Communication. Need for Communication. Types of communication. Written & Verbal communication. Formal and informal communication (The grapevine), upward and downward communication. Non-Verbal, Body Language and Graphic Language. Barriers to effective communication and how to overcome them; brevity, clarity and appropriateness in communication. 2) **Channels of communication:** language as a tool for communication. Developing effective messages: Thinking about purpose, knowing the audience, structuring the message, selecting proper channels, minimizing barriers & facilitating feedback. 3) **Writing:** Selecting material for expository, descriptive , and argumentative pieces, business letters; formal report; summarizing and abstracting ; expressing ideas within a restricted word limit; paragraph division; the introduction and the conclusion; listing reference material; use of charts, graphs and tables ; punctuation and spelling; semantics of connectives, modifiers and modals; variety in sentences and paragraphs. Preparing Agenda and writing minutes for meetings, Case writing and Documentation 4) **Technical Communication:** Nature, Origin and Development. Salient features. Scope & Significance. Forms of Technical Communication. Difference between Technical Communication & General writing. Objective Style vs. Literary Composition. 5) **Business communication**: Importance of written business correspondence. General principles and essentials of good commercial correspondence. Different types of commercial correspondence & their drafting. Types of Business letters. Official letters, electronic communication process.	

Section – II

Topic	Hrs
1) **Career Skills:** Interview skills**,** Applying for job, Cover letters, Resume and Effective Profiling, group discussion, letter writing, e-mail writing and e-mail etiquettes. 2) **Formal written skills:** Report writing – preparing rough draft, editing and preparing final report, Office Drafting: Circular, Notice, and Memo. Business correspondence: Enquiry, Order letter, Complaint letter, and Adjustment letter. Defining, Describing Objects & Giving Instructions. 3) **Introduction to Phonetics:** Introduction to Vowels and Consonants and associated Phonetic symbols. Introduction to Accent, Intonation and Rhythm.	

4) **Soft Skills:** Empathy (Understanding of someone else point's of view) Intrapersonal skills, Interpersonal skills, Problem solving, Reflective thinking, Critical thinking, Negotiation skills. 5) **Modern Technology and Communication:** Globalization of Business, Role of Information Technology. Tele-communication. Internet. Tele-conferencing and Video-conferencing.	

Books Recommended:

1. M.Ashraf Rizvi **Effective Technical Communication (Tata McGraw Hill Companies)**
2. Bhaskaran & Horsburgh **Strengthen Your English** (**Oxford University Press)**
3. Andrea J Rutherfoord Basic **Communication Skills for Technology (Pearson Education Asia)**
4. Orient Longman **English Skills for Technical Students**, **WBSCTE with British Council,**
5. P.Eliah **A hand book of English for professionals**. **(Pharma book syndicate)**
6. Judy Garton-Sprenger **B.B.C. English Stage 1 (B.B.C. English)**
7. **Spoken English** in 3 volumes with 6 cassettes, OUP. **(CIEFL)**
8. T.Balasubramanian **A textbook of English Phonetics for Indian Students by (Macmillan)**
9. KK Ramchandran **Business communication (Macmilan)**
10. S R Inthira & V Saraswathi " **Enrich your English – a) Communication skills b) Academic skills " (CIEFL & OUP)**
11. Mohan Krishna & Banerji Meera. **Developing communication skills (Macmillan)**

T.1.2.1Pharmaceutics – II(Unit Operation)
Theory -4 hour/week

Section I	Hrs
Note: - Numerical problems not included.	
1.Heat Transfer: - Modes of heat transfer, heat transfer in solid & liquids, heat transfer equipments, heater & heat exchanger.	04
2.Distillation :- Boiling point & equilibrium diagrams, principles of fractionation, small scale **&** large scale batch type & continuous type fractionation, fractionating columns & their accessories, reflux, vacuum, steam distillation & their molecular distillation. Application of distillation to solvent purification, mfg. of essential oils & alcohol distillation.	05
3.Drying: - Theory & mechanism of drying, equipments, classification, batch dryers, continuous dryers, atmospheric pressure & vacuum dryers, introduction to tray, cabinate, truck, tumbling, fluidized bed, spray, drum, rotary & freeze drying. Uses of dryers in pharma departments like tablets.	07
4.Filtration: Mechanism of filtration, Theories of filtration, Factors influencing filtration, filter media and filter aids. Classification of filtration equipment- Plate and frame filter press, Filter leaf, Metafilter, Cartridge filter, Drum filter.	04
5.Corrosion: Mechanism of corrosion, types of corrosion and ageing, factors influencing corrosion and method of combating corrosion.	03
6.Fluid flow: Fluid status, mechanism of fluid flow, Bernoulli's theorem, fluid heads, fluid Handling	04
7.Fluidization: Theory of Fluidization, Application of fluidization in pharmacy in the areas of powder handling, agglomeration, drying and coating.	03

Section II	
Topic	Hr.
1.Evaporation: - Introduction, Factors influencing rate of evaporation, classification of evaporates, pan kettles, horizontal tube, vertical tube & film evaporators. Evaporator accessories, multiple effect evaporators .application related to galenicals.	04
2. Extraction:- Solid -liquid and liquid-liquid extraction ,various small scale and large scale equipment , application of various extractors in the extraction of drugs.	03
3.Crystallization:- Crystal forms and habits , solubility curves , supersaturation, nucleation , growth, yield and purity -Mier's theory-crystallizers, their classification, design, operation and selection, uses of crystallizers in the mfg. of various therapeutic entities having specific crystalline nature .	04
4. Centrifugation: Theory, classification of centrifuges, principle**,** construction and working of the centrifuges Ex: Perforated basket centrifuge, Horizontal continuous centrifuge, supercentrifuge and conical disc centrifuge.	04
5. Environmental control:- air conditioning ,refrigeration , water vapour – air mixture ,humidity and particulates in air refrigeration.	04
6.Size reduction: Importance in pharmacy, factors influencing size reduction grinding mills of various types like hammer mill, multimill, conico cylindrical, ball mill, edge and end runner mill, fluid energy mill.	04
7.Size separation : Sieves, sifting, size gradation, size distribution- methods of determining size distribution	03
8. Handling and Conveying: Solids: trucks, trailers, power shovels, gantry cranes. Permanent installations for handling solids, conveyors belt, chain, screw and pneumatic conveyors. **Fluids:** pumps, pipes and fittings, valves, pipe connections. Application in pharmacy	04
Total: 60 Hrs	

P.1.2.1 Pharmaceutics – II(Unit Operation)
Practical 3 hour/week

Experiments

1) Determination of rate of evaporation*
2) Determination of rate of drying, free moisture content and bound moisture content**
3) Experiments to illustrate the influence of various parameters on the rate of drying**
4) Experiments to illustrate principles of size reduction*
5) Determination of humidity- use of Dry and Wet bulb.*
6) Evaluation of filter media, determination of rate of filtration and study of factors affecting filtration*
7) Drying of wet granules and to plot the rate of drying curves. **
8) Operation of sieve shaker and sieve analysis. **
9) Particle size measurement by stokes law. *
10) Experiment of homogenizer and to measure homogeneity of the* product
11) Experiments on methods of crystallization, study of crystal habits**
12) Demonstration of simple distillation process.
13) Experiment based on extraction process**

Major Expt**
Minor Expt*

Books Recommended

1) **K. Sambamurthy--** Pharmaceutical Engineering, New Age International Pvt. Ltd.
2) **W.L.Badger & J. T. Banthero--** Introduction to Chemical Engineering
3) **David Ganderton.** --- Unit Process in Pharmacy, Medical Books Ltd. London
4) **G.G. Brown**--- Unit Operations, CBS Publishers and Distributors, New Delhi.
5) **Robbert H. Perry, Don W, Green.---**Perry's Chemical Engineering Hand Book, 7th edition, International Edition, McGraw Hill
6) **N.G.Pandya., C.S.Shah**---- Elements of Heat Engines, Charotar Book Stall, Tulsi Sadan, Anand (W. Rly), India
7) **Donald P. Eckman** ---- Industrial Instrumentation, Seventh Wiley Eastern, Reprint, 1983, Wiley Eastern Ltd, 4835/24, Ansari Road, Daryaganj, New Delhi 110 002
8) **C**. **V.S. Subrahmanyam----** Pharmaceutical Engineering principles and practices**,** Vallabh prakashan, New Delhi.

T. 1.2.2 - Pharmaceutical Chemistry – II (Inorganic &Physical Chemistry) (Theory)(3 hours/week)

Section I

Sr. No.	Topics	Hrs.
1	**Topical Agents:** Protectives, Astringents and Anti-infectives.	06
2	**Dental products:** Dentifrices, Anti-caries agents	03
3	**Complexing and chelating agents used in pharmacy**	02
4	**Inorganic radiopharmaceuticals and contrast media :**Radiopharmaceuticals, Radiation dosimetry, Biological effects of radiations, Applications of Radiopharmaceut Radiopaque contrast media.	06
5	**Miscellaneous agents :** Sclerosing agents, Expectorants, Emetics, Poison and Antidotes Sedatives, Antioxidants, Pharmaceutical aids used in pharmaceutical industry.	06
	TOTAL	**23**

Section II

	Topics	Hrs.
6	**Behavior of Gases** : Kinetic theory of Gases, Deviation from behavior and explanation	04
7	Chemical Kinetics: Zero, first and second order reactions, complex reactions, theories of reaction kinetics, catalysis, characteristics of homogeneous and heterogeneous catalysis, acid base and enzyme catalysis	08
8	Quantum Mechanics: Postulates of quantum mechanics, operators in quantum mechanics, the Schrodinger wave equation	06
9	**Photochemistry:** Consequences of light absorption, Jablenski diagram, Lambert-Beer'law, Quantum efficiency	04
	TOTAL	**22**

P. 1.2.2 - Pharmaceutical Chemistry – II (Inorganic &Physical Chemistry) (Practical)(3 hours/week)

Sr.No.	Topics	No. of Experiments
1	Identification tests for pharmacopoeial inorganic pharmaceu and qualitative tests for cations and anions should be covered **	At least 04
2	To determine molar mass by Rast method and cryoscopic method.*	At Least 02
3	To determine molar mass of volatile liquids by Victor-Meyer method.*	At Least 02
4	To determine the heat of solution, heat of hydration and heat of neutralization.**	At Least 02
5	To determine rate constant of simple reaction.*	At Least 02

*** Indicates Minor Experiments** **** Indicates Major Experiment**

Books Recommended:

1. Vogel's Textbooks of qualitative Inorganic Analysis By Denny, Jeffery.
2. Practical Pharmaceutical inorganic chemistry, By Beckett & Stenlake.
3. Inorganic Medicinal & Pharmaceutical Chemistry By Block & Roche.
4. Text book of Pharmaceutical Chemistry, By Chatten L.G.(Dekker series).
5. Textbook of Pharmaceutical analysis By Connors K.A.
6. Text book of Pharmaceutical analysis By Dr. H. N. More.
7. Indian Pharmacopoeia.
8. British Pharmacopoeia.
9. Remington's Pharmaceutical Sciences.
10. Textbook of Inorganic pharmaceutical chemistry By Siddique.
11. Textbook of Inorganic pharmaceutical chemistry By Dr. K.G.Bothara.
12. Textbook of Inorganic pharmaceutical chemistry By Dr. Kasture and Wadodkar.
13. Textbook of Inorganic pharmaceutical chemistry By Dr. Kasture and Wadodkar.
14. Essentials of Physical chemistry By Bahl and Tuli.
15. Principles of Physical chemistry By Maron and Prutton.
16. Physical pharmacy and pharmaceutical sciences by Martin.

T.1.2.3 Pharmaceutical Chemistry – III (Organic Chemistry-I)

Theory: 4 hours / week

Section I

	Topics	Hrs.
1.	Introduction to organic chemistry :Importance and properties of carbon, Hybridization of elements, Atomic structure, Atomic orbitals, Molecular orbital theory, Types of Bonding , Bond dissociation energy, Polarity of bonds, Polarity of molecules.	10
2.	Stereochemistry: Isomerism, stereo isomerism, Geometric isomerism, optical activity, Fischer and Newmanns projections of molecules, Enantiomers, Disteriomers, Racemic modifications, Meso compounds, Elements of symmetry, chirality, chiral centers, R & S, Z & E,D& L configurations, Sequence rule.	14
3.	Reactive intermediates - carbocations, carbanions, carbenes, Reagents: Electrophiles and Nucleophiles.	06
	TOTAL	**30**

Section II

	Topics	Hrs.
4.	Structure; Nomenclature; Preparation and Reactions of: **A.** Alkanes, Alkenes, Alkynes, Cycloalkanes, Dienes, Trienes **B.** Aldehydes and ketones, Amines, Alcohols, Ethers, Benzene, Epoxides, Arenes, Carboxylic acids, Functional derivatives of Carboxylic acids **C.** Polynuclear aromatic compounds (Naphthalene, Phenanthrene, Anthracene)	10 15 05
	TOTAL	**30**

P.1.2.3. Pharmaceutical Chemistry – III (Organic Chemistry-I)

Practical :3hrs / week

Sr.no.	Topic
1	The student should be introduced to the various laboratory techniques involving synthesis of selected organic compounds ➢ P-Nitroaniline* ➢ P-Bromoacetanilide* ➢ Benzanilide* ➢ Phenyl Benzoate* ➢ Anthraquinone* ➢ 2,4,6 Tribromophenol*
2	Identification of organic compounds and their derivatisation (Atleast 05).**
3	Introduction to the use of stereomodels.

***** **Indicates Minor Experiments** ****** **Indicates Major Experiment**

Books Recommended:

1. Organic Chemistry by I.L. Finar vol. I and II ELBS / Longman, London
2. Organic synthesis by Gilman and Blatt Collective vol 3
3. Stereochemistry of carbon compounds by E.L. Eliel Mc. Graw Hill Book Co, Inc. New York.
4. Advanced organic chemistry by Bahl and Bahl
5. Organic chemistry by T.R. Morrison and R. Boyd, Prentice Hall of India Pvt. Ltd. New Delhi
6. Organic chemistry by Hendrickson, Cram and Hammond.
7. Frontier orbitals and organic chemistry by lan Flaming.
8. Principles of organics synthesis by R.O.C. Norman
9. Introduction to organic chemistry – By Streitweiser and Health Cook
10. Reaction mechanisms in organic chemistry by Mukherjee and Singh.

T.1.2.4- Anatomy, Physiology And Health Education-I (Theory) (3 Hrs/ Week)

SECTION-I

	Topics	Hrs
1	Introduction to anatomy and physiology and common anatomical terms.	02
2	Cells, Tissues and organization of the body. - Structure, components , functions, cell cycle, protein synthesis	04
3	Musculoskeletal System - Bone- Types, Structure, Composition and Functions - Skeleton- Axial and Appendicular Skeleton and cavities of the body. - Joints- Classification, Types and Functions - Muscle tissue- Smooth, Cardiac, Skeletal muscle and its contraction,structure, principle and functions	10
4	Special sense organs- Structure, and functions of organs of Taste, Smell, Vision, Touch and Hearing	05
5	Resistance and Immunity- Types and its functions	02

SECTION-II

	Topics	Hrs
1	Nervous System- - Defination, Classification, Structure and functions of various parts of CNS and PNS, transmission of impulse, reflex action	06
2	Endocrine System Location, hormones and functions of various endocrine glands and negative feedback mechanism	04
3	Haemopoeitic System Composition, functions of blood and its elements, transfusion of blood , coagulation of blood and blood group	04
4	Lymh and Lymphatic System - Functions, composition, formation and circulation of lymph, structure and functions of lymph glands and spleen	02
5	Health Education Concept of health - Defination, Types, Determinant and Indicator of Health, Role of pharmacist in community. Concept of disease -Defination, Web of causation, History of disease- agents, host and environment, concept of prevention of diseases. Demography and family planning -Demography, Demographic cycle, Family Planning, Role of WHO, Measurement of fertility, Contraceptive methods	06

Total Hrs:-45

Books Recommended:

1) Guyton & Hall. Textbook of medical physiology, Elsevier. New Delhi, 2000 10th edition.

2) Vander, Sherman, Luciano. Human Physiology. Mc-Graw Hill Publication New Delhi 1998 7th edition.
3) Tortora G.J. Principles of anatomy & physiology. Harper Collins College Publishers, New York 1996 8th
edition.
4) Chatterjee C.C. Human Physiology. Medical allied agency. Kolkata 2003
11th Edition.
5) Ross and Wilson. Anatomy and Physiology in health and illness. Churchill Livingstone 2001. 9th edition.
6) AB Mc Naught and Callander R., " Illustrated Physiology", B.I. Churchill Living Stone, New Delhi, 987. 1st edition.
7) Chaudhry Sujit K., "Consise Medical Physiology", New Cenrtal Book Agency, Calcutta, 1993. 2nd edition
8) Douglas E., Kelly, Richard Wood and Allen C. Enders, " Bailey`s TextBook of Microscopic Anatomy", Williams and Wilkins publishers, London,
1984. 18th Edition
09) Elaine N. Marieb, "Human Anatomy and Physiology", Addison Wesley, New York, 1997 4th edition.
10) Inderbir Singh, " Text Book of Human Histology with Colour Atlas, Jaypee Brothers, New Delhi, 2002. 4th edition.
11) P.C.Dandiya " Health Education and Community Pharmacy", Vallabh Prakashan New Delhi, 2007, 5th edition
12) R.P.Phate " Anatomy Physiology and Health Education" Carrier Publication,Nashik,2007,3rd edition

P.1.2.4- Anatomy, Physiology And Health Education-I (Practicals) (3 Hrs/ Week)

1	Study of human skeleton – Identification of bones*
2	Study with the help of charts and models of following Systems and organs* - Nervous System - Endocrine System - Haemopoeitic System - Lymphatic System
3	Study of different family planning devices*
4	Study of Microscope*
5	Microscopic study of permanent slides* - Epithelial , Connective, Nervous and muscular tissue - Tongue , thyroid , testes, ovary, blood smear blood vessel, pancreas, spleen, stomach, intestine, spinal cord, cerebrum, cerebellum, lungs
6	Haematology - Determination of RBC count of blood** - Determination of total WBC count of blood** - Determination of differential WBC count of blood** - Determination of clotting time and bleeding time of blood* - Determination of haemoglobin content of blood* - Determination of ESR** - Determination of blood group* - Determination of blood pressure* -

* Indicate Minor Experiment ** Indicate Major Experiment

Books Recommended Books-

1. Ranade V.G., Pradhan S, Joshi P.N. Text Book of Practical Physiology. Pune Vidyapith Griha Prakashan, Pune, 1997

2. Mukherjee K.L. Medical Laboratory Technology. Tata McGraw Hill. New Delhi,1999 4th edition (Vol.I,II,III)

3. Bharihoke V. Text book of Histology .A.I.T.B.S Publication. 2005, 2nd edition

T.1.2.5. Industrial Psychology

(Theory) (3 hrs/ week)

Section-I

	TOPICS	Hrs.
1.	**Introduction to Industrial Psychology** Definition of Psychology : subfields of Psychology; Industrial Psychology; its definition, nature and scope. History of Industrial Psychology, Premises of Industrial Psychology. Modus operandi of Industrial Psychology. Development of Industrial Psychology. Hurdles in the way of Industrial Psychology.	05
2.	**Personnel Selection** Occupational information, individual differences. Personnel specification, its types and objectives. Methods of Job analysis. Uses of Job analysis. Types of personnel actions. Selection techniques : Application blanks, references, interview and Psychological Tests. Intelligence (otis, standord-Binet, Weehster adult Intelligence test, Multifactor test); Aptitude (DAT); Personality (Rorschaeh, TAT and MMPI).	08
3.	**Personnel Development** **Motivation :** Theories of Motivation (Maslow, Vroom) Motivation & Organisation. Incentives, financial and non-financial job satisfaction. Herzberg's two factor theory. Factors affecting satisfaction. Morale and Monotony. Definition and nature of leadership. Functions of leaders. Trait theory of leadership: Managerial grid. Fieldless contingency Model.	07 02
4.	**Accident Prevention and Safety measures**.	

Section - II

	TOPICS	Hrs.
5.	**Introduction to Sociology** What is Sociology ? The relevance of sociology to industry. Personality and social behaviour, Social adjustment of workers, Definition and levels of communication, Process of communication, Types of communication, Improving communication in organisation.	05
6.	**Industrial Democracy** What is Industrial Democracy ? Worker participation in Management.	05
7.	**Trade Unions** Problem of trade unions in India. Collective bargaining. Industrial disputes, its causes and methods to resolve.	06 06
8.	**Science, Technology, Industry and Society** Science & Technology, Impact of Science & Technology on industry and society. The role of industry in national development. Cottage, small and large scale industries. Problems of industrialisation with special reference to the Pharmaceutical industry.	

Total Hrs. :- 44

Books

Text book

1. Bhagwatwar P.A., Psychology of Industrial and Organisational behaviour.

Reference books

1. Ghosh, P.K. & Ghorpode, M.B. Industrial Psychology.
2. Ghosh, P.K. & Ghorpode, M.B., Industrial and Organisational Psychology.
3. Rao, P.K. & Thakurdesai, V.U. Industrial Psychology and Organisational behaviour.
4. Giri, V.V. Labour problems in Indian industries.
5. Trade Unionism by Varma and Dixit.
6. Industrial Psychology by V.Schneider.
7. A Sociology of work in Industry by A.Fox.
8. Social Psychology by Barrew and Byrne.
9. Industrial Conflicts by A.Kornhauser, R.Dubiw and A.M.Ross.