

**INDIRA GANDHI UNIVERSITY, MEERPUR-REWARI,
HARYANA-122502**

(A State University Established under Haryana Act No.29 of 2013)

(Recognized u/s 12(B) & 2(f) of UGC Act, 1956)

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Syllabus and Scheme of Examination

(in accordance with National Education Policy 2020)

for

Two-Year Postgraduate Programme

in

Pharmacy (Scheme-D)

Effective from Academic Session 2026-27

Department of Pharmaceutical Sciences

Faculty of Pharmaceutical Sciences

Indira Gandhi University

Meerpur - Rewari (122502)

Haryana, India

Signature

Sanjay

Signature

Signature

Details of Approvals

Council/Board	Date	Remark
Staff Council	23.07.2026	
Board of Studies	24.08.2026	
Faculty	Pharmaceutical Sciences	
Academic Council		
Year of implementation	2026	


Chairperson
(Signature with Stamp)

VISION AND MISSION OF THE UNIVERSITY

VISION

To be a globally renowned university, recognized for excellence in teaching, innovative research, and welfare of the society, imbibing the spirit of "*Vasudhaiv kutumbkam*".

MISSION

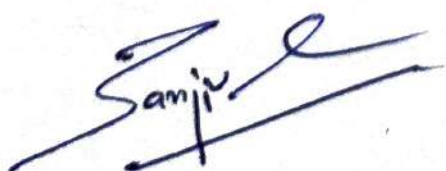
- To introduce and implement innovation in teaching and learning process matching up the global standards to strengthen academic delivery through curriculum design, teaching pedagogy and usage of ICT.
- To develop a mechanism that attracts talented, qualified and experienced faculty from across the globe for pursuing their academic and research careers at the University.
- To offer academic programs at UG, PG, doctoral, Post-Doctoral levels which are learner-centric, industry focused, and adhere to outcome based international models.
- To create an ambiance that is conducive for undertaking sponsored research, innovation and consultancy services to a wide spectrum of societal and industrial requirements while encouraging interdisciplinary approach of learning, team work, and research.
- To establish state of art centres of excellence in frontier areas of research and design innovation through industry collaboration to innovate and incubate the products and services.
- To establish smart campus and promote e-governance activities in the university for the digitally empowered society and knowledge economy.
- To provide a hygienic, modern, environment friendly and vivacious campus attuned to the urgent needs of Green Technology.
- To consider and implement norms, metrics, standards, procedures and benchmarks for assessing and improving the quality in every aspect of university system and achieve quality certifications by National and International bodies.
- To make society self-reliant by organizing various programmes including literacy, gender sensitization, health awareness, and dissemination of information about livelihood generation.

Programme Outcomes of M. Pharmacy (Pharmacognosy)

Programme Outcomes

The aim of the course is to provide comprehensive knowledge, training and proficiency to the students so that they will be able to work in industry, clinical set ups, drug control organizations, academic and research sectors in pharmaceuticals. At the end of the course, he/she will be able to perform the following:

PO-1	Advanced Knowledge	Demonstrate an in-depth understanding of pharmacognostical principles, including the study of medicinal plants, natural products, and their chemical constituents.
PO-2	Proficiency	Develop proficiency in various extraction and analytical techniques used in pharmacognosy, such as chromatography, spectroscopy and bioassays. Critically evaluate the quality, safety, and efficacy of herbal medicines and natural products based on scientific evidence and traditional knowledge.
PO-3	Effective Communication	Provide effective communication skills to disseminate pharmacognosy-related information to healthcare professionals, policymakers and the public.
PO-4	Applicability	Acquire research skills necessary for conducting independent research in pharmacognosy, including experimental design, data analysis, and interpretation of results.
PO-5	Ethics	Understand the ethical and regulatory considerations related to the development, manufacturing and marketing of herbal medicines and natural products.
PO-6	Collaboration and Interdisciplinary Approach	Learn to collaborate effectively with professionals from other disciplines, such as pharmacology, chemistry, botany and medicine, to address complex healthcare challenges.
PO-7	Self-directed and Life-long Learning	Acquire the ability to engage in independent and life-long learning to stay updated with advancements in pharmacognosy and related fields.



Scheme of Examination for Postgraduate Programme

Programme	Master of Pharmacy (Pharmacognosy)
Semester	4
Total Marks	2325
Total Credit	Minimum = 95 Maximum = 100*
Framework	CBSS
Scheme	D

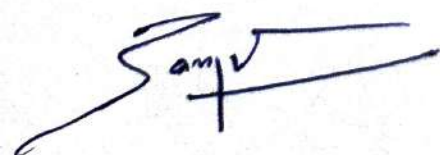
VISION OF THE DEPARTMENT

The Department of Pharmaceutical Sciences is committed to reach to the highest echelons of professionalism by imparting quality education and focusing on socially and environmentally relevant research, at par with the highest global standards.

MISSION OF THE DEPARTMENT

Our mission is to:

- Educate and train young minds into quality pharma personnel who can be an asset to the pharmaceutical profession.
- Provide an integrated, multidisciplinary education in pharmaceutical sciences to students enrolled in the different programs of the department, abiding all statutory guidelines.
- Provide a conducive and creative atmosphere in which higher studies and research thrive in tandem amongst students and the faculty.
- Inspire all faculty members to contribute to nation building by serving as resource persons in areas of their expertise.
- Encourage innovative research programs in emerging areas of drug research and sustainable development, by championing collaboration and interdisciplinary learning and research.
- Promote inclusion of all stakeholders to participate in the activities of the department, including parents and alumni.



REGULATION

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the Master of Pharmacy (M. Pharm.) Degree Program - Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by the authorities of the university.

2. Minimum qualification for admission

A pass in the following examinations

- a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B. Pharm.)
- b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B. Pharm.)

3. Duration of the program

The program of study for M. Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from the month of December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.


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7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extracurricular activities are dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course and is obtained by using a multiplier of one (1) for lecture and a multiplier of half ($1/2$) for practical (laboratory) hours. Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2. The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by $1/2$. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

7.2. Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits are distributed semester-wise as shown in Table 05. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

9. Course of study

The specialization in M. Pharm program is given in Table 1.



Table 1: M. Pharm. Specialization and Code

S. No	Specialization	Code
01	Pharmacognosy	MPG

The course of study for M. Pharm specializations shall include Semester wise Theory & Practical as given in Table 2 to 6. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table 2 to 6.

Table 2: Course of study for M. Pharm. (Pharmacognosy)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester - I					
26L6.5-PHR-MPG101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
26L6.5-PHR-MPG102T	Advanced Pharmacognosy-I	4	4	4	100
26L6.5-PHR-MPG103T	Phytochemistry	4	4	4	100
26L6.5-PHR-MPG104T	Industrial Pharmacognostical Technology	4	4	4	100
26L6.5-PHR-MPG105P	Pharmacognosy Practical I	12	6	12	150
26L6.5-PHR-SA1	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester - II					
26L6.5-PHR- MPG201T	Medicinal Plant biotechnology	4	4	4	100
26L6.5-PHR- MPG202T	Advanced Pharmacognosy-II	4	4	4	100
26L6.5-PHR- MPG203T	Indian system of medicine	4	4	4	100
26L6.5-PHR- MPG204T	Herbal cosmetics	4	4	4	100
26L6.5-PHR- MPG205P	Pharmacognosy Practical II	12	6	12	150
26L6.5-PHR-SA2	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table 3: Course of study for M. Pharm. III Semester (Pharmacognosy)

Course Code	Course	Credit Hours	Credit Points
26L7.0-PHR- MRM301T	Research Methodology and Biostatistics*	4	4
26L7.0-PHR-JC1	Journal club	1	1
26L7.0-PHR-DP1	Discussion / Presentation (Proposal Presentation)	2	2
26L7.0-PHR-RW1	Research Work	28	14
-	Total	35	21

* Non-University Exam

[Handwritten signatures and marks]

Table 4: Course of study for M. Pharm. IV Semester (Pharmacognosy)

Course Code	Course	Credit Hours	Credit Points
26L7.0-PHR-JC2	Journal club	1	1
26L7.0-PHR-RW2	Research Work	31	16
26L7.0-PHR-FP	Discussion / Final Presentation	3	3
-	Total	35	20

Table 5: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

***Credit Points for Co-curricular Activities**

Table 6: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/ Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/ Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/ National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)	02

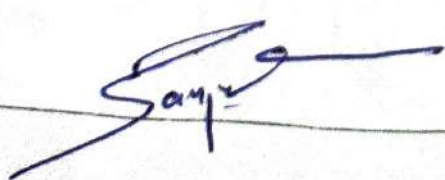
Note: International Conference: Held Outside India

International Journal: The Editorial Board Outside India

*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

10. Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.






2. The composition of the Programme Committee shall be as follows: A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M. Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.

3. Duties of the Programme Committee:

- i. Periodically reviewing the progress of the classes.
- ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
- iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Programme Committee shall meet at least twice in a semester preferably at the end of each sessional exam and before the end semester exam.

11. Examinations/Assessments

The schemes for internal assessment and end semester examinations are given in Table 7 and 8.

11.1. End semester examinations.

The End Semester Examinations for each theory and practical course through semesters I to IV shall be conducted by the respective university except for the subject with asterix symbol (*) in Table 8 for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

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Table 7: Schemes for internal assessments and end semester examinations (Pharmacognosy-MPG)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Contin-uous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
Semester -I								
26L6.5-PHR-MPG101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR-MPG102T	Advanced Pharmacognosy-I	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR-MPG103T	Phytochemistry	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR-MPG104T	Industrial Pharmacognostical Technology	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR-MPG105P	Pharmacognosy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
26L6.5-PHR-SA1	Seminar/Assignment	-	-	-	-	-	-	100
Total								650
Semester -II								
26L6.5-PHR-MPG201T	Medicinal Plant biotechnology	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR-MPG202T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR-MPG203T	Indian system of medicine	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR-MPG204T	Herbal cosmetics	10	15	1 Hr	25	75	3 Hrs	100
26L6.5-PHR- MPG205P	Pharmacognosy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
26L6.5-PHR-SA2	Seminar/Assignment	-	-	-	-	-	-	100
Total								650

Table 8: Schemes for internal assessments and end semester examinations (Semester III & IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Contin-uous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
Semester -III								
26L7.0-PHR-MRM301T	Research Methodology and Biostatistics*	10	15	1Hr	25	75	3Hrs	100
26L7.0-PHR-JC1	Journal Club	-	-	-	25	-	-	25
26L7.0-PHR-DP1	Discussion / Presentation (Proposal presentation)	-	-	-	50	-	-	50
26L7.0-PHR-RW1	Research Work *	-	-	-	-	350	1Hr	350
Total								525
Semester -IV								
26L7.0-PHR-JC2	Journal club	-	-	-	25	-	-	25
26L7.0-PHR-RW2	Research Work	-	-	-	75	-	-	75
26L7.0-PHR-FP	Discussion / Final Presentation	-	-	-		400	1Hr	400
Total								500

* Non-University Exam

11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below

Table 9: Scheme for awarding internal assessment: Continuous mode

THEORY	
Criteria	Maximum marks
Attendance (Refer Table--10)	8
Student – Teacher interaction	2
Total	10
PRACTICAL	
Attendance (Refer Table--10)	10
Based on Practical Records, Regular Viva voce, etc.	10
Total	20

Table 10: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95-100	8	10
90-94	6	7.5
85-89	4	5
80-84	2	2.5
Less Than 80	0	0

11.2.1. Sessional Exams

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

12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M. Pharm. programme if he/she secures at least 50% marks in that particular course including internal assessment.

13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

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

15. Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 11. The exact dates of examinations shall be notified from time to time.

Table 11: Tentative schedule of end semester examinations

Semester	For Regular Candidates	F or Failed Candidates
I and III	November / December	May / June
II and IV	May / June	November / December

16. Allowed to keep terms (ATKT):

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. ATKT rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and II semesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed. A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table 12.

Table 12: Letter grades and grade points equivalent to Percentage of marks and performances

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

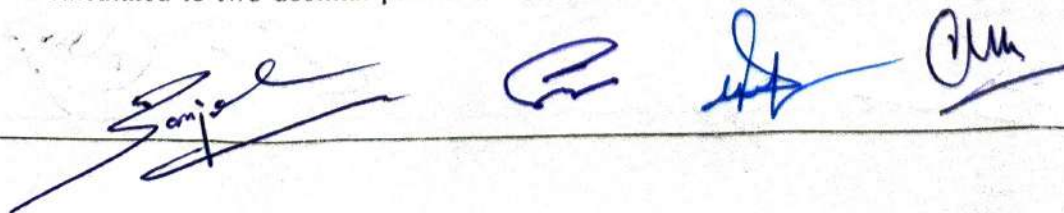
A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C_1 , C_2 , C_3 and C_4 and the student's grade points in these courses are G_1 , G_2 , G_3 and G_4 , respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4}{C_1 + C_2 + C_3 + C_4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall



take into consideration the F and ABS grade awarded in that semester. For example, if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * ZERO}{C_1 + C_2 + C_3 + C_4}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$CGPA = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4}{C_1 + C_2 + C_3 + C_4}$$

where $C_1, C_2, C_3, \dots$ is the total number of credits for semester I, II, III, $\dots$ and $S_1, S_2, S_3, \dots$ is the SGPA of semester I, II, III, $\dots$

20. Declaration of class

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

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

21. Project work

All the students shall undertake a project under the supervision of a teacher in Semester III to IV and submit a report. Four copies of the project report shall be submitted (typed & bound copy not less than 75 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). The projects shall be evaluated as per the criteria given below

Evaluation of Dissertation Book:

Objective(s) of the work done	:	50 Marks
Methodology adopted	:	150 Marks
Results and Discussions	:	250 Marks
Conclusions and Outcomes	:	<u>50 Marks</u>
Total	:	500 Marks

Evaluation of Presentation:

Presentation of work	:	100 Marks
Communication skills	:	50 Marks
Question and answer skills	:	<u>100 Marks</u>
Total	:	250 Marks

22. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the M. Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (two years) for the award of Ranks.

23. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

24. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

25. Revaluation/Retotaling of answer papers

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

26. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.



SEMESTER-I

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES- THEORY
(26L6.5-PHR-MPG101T)

SCOPE

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

COURSE OBJECTIVES

After completion of course student is able to know,

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

COURSE OUTCOMES

1. Provide knowledge regarding analysis of various drugs in single and combination dosage forms.
2. Impart theoretical and practical skills of the instruments.

UNIT	DETAILED SYLLABUS	Max. Hours: 60
I	UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy. Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers. Instrumentation and Applications of fluorescence spectrophotometer. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.	12 Hrs
II	NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and ¹³ C NMR. Applications of NMR spectroscopy.	12 Hrs
III	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and	8 Hrs

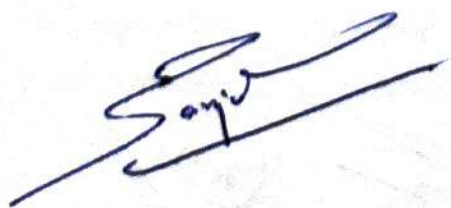
	MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	
IV	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: - Thin Layer chromatography - High Performance Thin Layer Chromatography - Ion exchange chromatography - Column chromatography - Gas chromatography - High Performance Liquid chromatography - Ultra-High Performance Liquid chromatography - Affinity chromatography - Gel Chromatography	10 Hrs
V	Electrophoresis: Principle, Instrumentation, working conditions, factors affecting separation and applications of the following: - Paper electrophoresis - Gel electrophoresis - Capillary electrophoresis - Zone electrophoresis - Moving boundary electrophoresis - Iso electric focusing X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	8 Hrs
VI	Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal	10 Hrs

analysis (DDTA).

TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Douglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods – Part B - J W Munson, Vol II, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.



ADVANCED PHARMACOGNOSY - I THEORY
(26L6.5-PHR MPG 102T)

SCOPE

To learn and understand the advances in the field of cultivation and isolation of drugs of natural origin, various phytopharmaceuticals, nutraceuticals and their medicinal use and health benefits.

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- Advances in the cultivation and production of drugs
- Various phytopharmaceuticals and their source, its utilization and medicinal value.
- Various nutraceuticals/herbs and their health benefits
- Drugs of marine origin
- Pharmacovigilance of drugs of natural origin

COURSE OUTCOMES

- Knowledge of advances in the cultivation and production of drugs, various phytopharmaceuticals and their source, its utilization and medicinal value.
- Knowledge about drugs of marine origin and various nutraceuticals/herbs along with their health benefits.
- Impart knowledge related to pharmacovigilance of drugs of natural origin

UNIT	DETAILED SYLLABUS	Max. Hours: 60
I	Plant drug cultivation: General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of Agricultural Research, Current Good Agricultural Practices, Current Good Cultivation Practices, Current Good Collection Practices, Conservation of medicinal plants- Ex-situ and In- situ conservation of medicinal plants.	12 Hrs
II	Marine natural products: General methods of isolation and purification, Study of Marine toxins, Recent advances in research in marine drugs, Problems faced in research on marine drugs such as taxonomical identification, chemical screening and their solution.	12 Hrs
III	Nutraceuticals: Current trends and future scope, Inorganic mineral supplements, Vitamin supplements, Digestive enzymes, Dietary fibres, Cereals and grains, Health drinks of natural origin, Antioxidants, Polyunsaturated fatty acids, Herbs as functional foods, Formulation and standardization of nutraceuticals, Regulatory aspects, FSSAI guidelines, Sources, name of marker compounds and	12 Hrs

	their chemical nature, medicinal uses and health benefits of following i) Spirulina, ii) Soya bean, iii) Ginseng, iv) Garlic, v) Broccoli, vi) Green and Herbal Tea, vii) Flax seeds, viii) Black cohosh, ix) Turmeric.	
IV	Phytopharmaceuticals: Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following. a) Carotenoids – i) α and β - Carotene ii) Xanthophyll (Lutein) b) Limonoids – i) d-Limonene ii) α - Terpineol c) Saponins – i) Shatavarins d) Flavonoids – i) Resveratrol ii) Rutin iii) Hesperidin iv) Naringin v) Quercetin e) Phenolic acids- Ellagic acid f) Vitamins g) Tocotrienols and Tocopherols h) Andrographolide, Glycolipids, Gugulipids, Withanolides, Vascine, Taxol Miscellaneous	12 Hrs
V	Pharmacovigilance of drugs of natural origin: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for biodrug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples.	12 Hrs

REFERENCES (Latest Editions of)

1. Pharmacognosy - G. E. Trease and W.C. Evans. Saunders Edinburgh, New York.
2. Pharmacognosy-Tyler, Brady, Robbers
3. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
4. Text Book of Pharmacognosy by T.E. Wallis
5. Marine Natural Products-Vol.I to IV.
6. Natural products: A lab guide by Raphael Ikan, Academic Press 1991.
7. Glimpses of Indian Ethano Pharmacology, P. Pushpangadam. Ulf Nyman, V. George Tropical Botanic Garden & Research Institute, 1995.
8. Medicinal natural products (a biosynthetic approach), Paul M. Dewick, John Wiley & Sons Ltd., England, 1998.
9. Chemistry of Marine Natural Products- Paul J. Schewer 1973.
10. Herbal Drug Industry by RD. Choudhary, Eastern Publisher, New Delhi, 1996.

11. Cultivation of Medicinal Plants by C.K. Atal & B.M. Kapoor.
12. Cultivation and Utilization of Aromatic Plants, C.K. Atal & B.M. Kapoor
13. Cultivation of medicinal and aromatic crops, AA Farooqui and B.S Sreeramu. University Press, 2001.
14. Natural Products from Plants, 1st edition, by Peter B. Kaufman, CRC Press, New York, 1998
15. Recent Advances in Phytochemistry- Vol. 1&4: Scikel Runeckles- Appleton Century crofts.
16. Text book of Pharmacognosy, C.K.Kokate, Purohit, Ghokhale, Nirali Prakasshan, 1996.
17. Pharmacognosy and Pharmacobiotechnology, Ashutoshkar, New Age Publications, New Delhi.

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PHYTOCHEMISTRY- THEORY
(26L6.5-PHR MPG103T)

SCOPE

Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phytoconstituents

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- Different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery
- Phytochemical fingerprinting and structure elucidation of phytoconstituents.

COURSE OUTCOMES

1. Understand different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery.
2. Skill to carryout phytochemical fingerprinting and structure elucidation of phytoconstituents.

UNIT	DETAILED SYLLABUS	Max. Hours: 60
I	Biosynthetic pathways and Radio tracing techniques: Constituents & their Biosynthesis, Isolation, Characterization and purification with a special reference to their importance in herbal industries of following phytopharmaceuticals containing drugs: a) Alkaloids: Ephedrine, Quinine, Strychnine, Piperine, Berberine, Taxol, Vinca alkaloids. b) Glycosides: Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Quercitin. c) Steroids: Hecogenin, Guggulosterone and Withanolides Coumarin: Umbelliferone. d) Terpenoids: Cucurbitacins	12 Hrs
II	Drug discovery and development: History of herbs as source of drugs and drug discovery, the lead structure selection process, structure development, product discovery process and drug registration, Selection and optimization of lead compounds with suitable examples from the following source: artemesin, andrographolides. Clinical studies emphasising on phases of clinical trials, protocol design for lead molecules.	12 Hrs
III	Extraction and Phytochemical studies: Recent advances in extractions with	12 Hrs

	emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave assisted extraction, Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques including preparative HPLC and Flash column chromatography.	
IV	Phytochemical finger printing: HPTLC and LCMS/GCMS applications in the characterization of herbal extracts. Structure elucidation of phytoconstituents.	12 Hrs
V	Structure elucidation of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (¹ H, ¹³ C) a) Carvone, Citral, Menthol b) Luteolin, Kaempferol c) Nicotine, Caffeine d) Glycyrrhizin.	12 Hrs

REFERENCES (Latest Editions of)

1. Organic chemistry by I.L. Finar Vol.II
2. Pharmacognosy by Trease and Evans, ELBS.
3. Pharmacognosy by Tylor and Brady.
4. Text book of Pharmacognosy by Wallis.
5. Clark's isolation and Identification of drugs by A.C. Mottal.
6. Plant Drug Analysis by Wagner & Blatt.
7. Wilson and Gisvolds text book of Organic Medicinnal and Pharmaceutical Chemistry by Deorge. R.F.
8. The Chemistry of Natural Products. Edited by R.H. Thomson, Springer International Edn. 1994.
9. Natural Products Chemistry Practical Manual by Anees A Siddiqui and SeemiSiddiqui
10. Organic Chemistry of Natural Products, Vol. 1&2. Gurdeep R Chatwal.
11. Chemistry of Natural Products- Vol. 1 onwards IWPAC.
12. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
13. Medicinal Natural products – a biosynthetic approach, Dewick PM, John Wiley & Sons, Toronto, 1998.
14. Chemistry of Natural Products, Bhat SY, Nagasampagi BA, Meenakshi S, Narosa Publishing House, New Delhi.
15. Pharmacognosy & Phytochemistry of Medicinal Plants, 2nd edition, Brunston J, Intercept Ltd., New York, 1999.

INDUSTRIAL PHARMACOGNOSTICAL TECHNOLOGY – THEORY
(26L6.5-PHR MPG 104T)

SCOPE

To understand the Industrial and commercial potential of drugs of natural origin, integrate traditional Indian systems of medicine with modern medicine and also to know regulatory and quality policy for the trade of herbals and drugs of natural origin.

COURSE OBJECTIVES

By the end of the course the student shall be able to know,

- The requirements for setting up the herbal/natural drug industry.
- The guidelines for quality of herbal/natural medicines and regulatory issues.
- The patenting/IPR of herbals/natural drugs and trade of raw and finished materials.

COURSE OUTCOMES

1. Understand the basic requirements for setting up the herbal/natural drug industry as per schedule-T.
2. Provides guidelines for quality of herbal/natural medicines and regulatory issues.
3. Development of skills about patenting/IPR of herbals/natural drugs and trade of raw and finished materials

UNIT	DETAILED SYLLABUS	Max. Hours: 60
I	Herbal drug industry: Infrastructure of herbal drug industry involved in production of standardized extracts and various dosage forms. Current challenges in upgrading and modernization of herbal formulations. Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction. Pilot plant scale –up techniques, case studies of herbal extracts. Formulation and production management of herbals.	12 Hrs
II	Regulatory requirements for setting herbal drug industry: Global marketing management. Indian and international patent law as applicable herbal drugs and natural products. Export - Import (EXIM) policy, TRIPS. Quality assurance in herbal/natural drug products. Concepts of TQM, GMP, GLP, ISO-9000.	12 Hrs
III	Monographs of herbal drugs: General parameters of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, Siddha and Unani Pharmacopoeia, American herbal pharmacopoeia, British herbal	12 Hrs

	pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.	12 Hrs
IV	Testing of natural products and drugs: Herbal medicines - clinical laboratory testing. Stability testing of natural products, protocols.	12 Hrs
V	Patents: Indian and international patent laws. proposed amendments as applicable to herbal/natural products and process. Geographical indication, Copyright, Patentable subject matters, novelty, non-obviousness, utility, enablement and best mode, procedure for Indian patent filing, patent processing, grant of patents, rights of patents, cases of patents, opposition and revocation of patents, patent search and literature, Controllers of patents.	12 Hrs

REFERENCES (Latest Editions of)

1. Herbal drug industry by R.D. Choudhary (1996), Eastern Publisher, New Delhi.
2. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), 1st Edition, Business horizons Robert Verpoorte, New Delhi.
3. Quality control of herbal drugs by Pulok K Mukarjee (2002), Business Horizons Pharmaceutical Publisher, New Delhi.
4. PDR for Herbal Medicines (2000), Medicinal Economic Company, New Jersey.
5. Indian Herbal Pharmacopoeia (2002), IDMA, Mumbai.
6. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (1996), Nirali Prakashan, New Delhi.
7. Text book of Pharmacognosy and Phytochemistry by Vinod D. RangarI (2002), Part I & II, Career Publication, Nasik, India.
8. Plant drug analysis by H. Wagner and S. Bladt, Springer, Berlin.
9. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.I, Eastern Publisher, New Delhi.
10. Phytochemical Dictionary. Handbook of Bioactive Compounds from Plants by J.B. Harborne, (1999), IInd Edition, Taylor and Francis Ltd, UK.
11. Herbal Medicine. Expanded Commission E Monographs by M. Blumenthal, (2004), 1st Edition, Drug Formulation Manual by D.P.S. Kohli and D.H. Shah (1998), Eastern Publisher, New Delhi.

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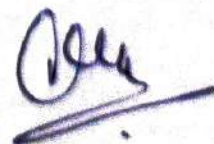






PHARMACOGNOSY PRACTICAL - I
(26L6.5-PHR MPG I05P)

1. Analysis of Pharmacopoeial compounds of natural origin and their formulations by UV Vis spectrophotometer
2. Analysis of recorded spectra of simple phytoconstituents
3. Experiments based on Gas Chromatography
4. Estimation of sodium/potassium by flame photometry
5. Development of fingerprint of selected medicinal plant extracts commonly used in herbal drug industry viz. Ashwagandha, Tulsi, Bael, Amla, Ginger, Aloe, Vidang, Senna, Lawsonia by TLC/HPTLC method.
6. Methods of extraction
7. Phytochemical screening
8. Demonstration of HPLC- estimation of glycerrhizin
9. Monograph analysis of clove oil
10. Monograph analysis of castor oil.
11. Identification of bioactive constituents from plant extracts
12. Formulation of different dosage forms and their standardisation.



SEMESTER-II

MEDICINAL PLANT BIOTECHNOLOGY- THEORY
(26L6.5-PHR- MPG 201T)

SCOPE

To explore the knowledge of Biotechnology and its application in the improvement of quality of medicinal plants

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to,

- Know the process like genetic engineering in medicinal plants for higher yield of Phytopharmaceuticals.
- Use the biotechnological techniques for obtaining and improving the quality of natural products/medicinal plants

COURSE OUTCOMES

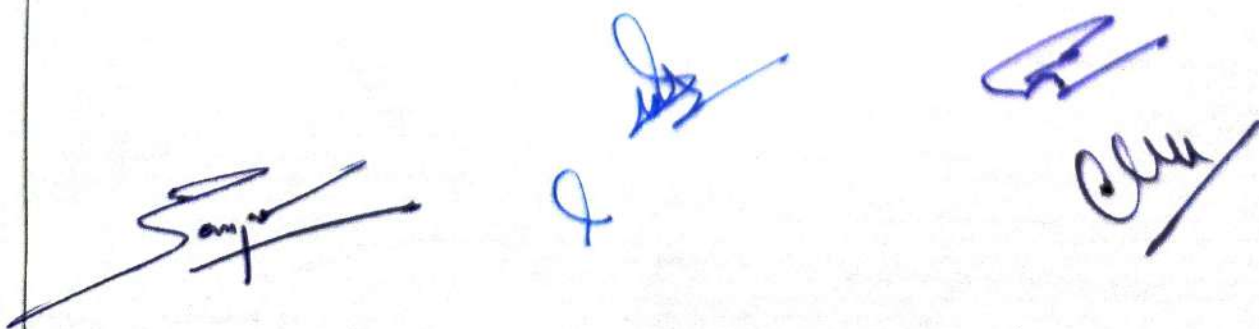
1. Understand the process like genetic engineering in medicinal plants for higher yield of Phytopharmaceuticals.
2. Skills of using of biotechnological techniques for improving the quality of natural products/medicinal plants

UNIT	Detailed syllabus	Total 60 Hrs
I	Introduction to Plant biotechnology: Historical perspectives, prospects for development of plant biotechnology as a source of medicinal agents. Applications in pharmacy and allied fields. Genetic and molecular biology as applied to pharmacognosy, study of DNA, RNA and protein replication, genetic code, regulation of gene expression, structure and complicity of genome, cell signaling, DNA recombinant technology.	12 Hrs
II	Different tissue culture techniques: Organogenesis and embryogenesis, synthetic seed and monoclonal variation, Protoplast fusion, Hairy root multiple shoot cultures and their applications. Micro propagation of medicinal and aromatic plants. Sterilization methods involved in tissue culture, gene transfer in plants and their applications.	15 Hrs
III	Immobilization techniques & Secondary Metabolite Production: Immobilization techniques of plant cell and its application on secondary metabolite Production. Cloning of plant cell: Different methods of cloning and its applications. Advantages and disadvantages of plant cell cloning. Secondary metabolism in	15 Hrs

	tissue cultures with emphasis on production of medicinal agents. Precursors and elicitors on production of secondary metabolites.	
IV	Biotransformation and Transgenesis: Biotransformation, bioreactors for pilot and large scale cultures of plant cells and retention of biosynthetic potential in cell culture. Transgenic plants, methods used in gene identification, localization and sequencing of genes. Application of PCR in plant genome analysis.	13 Hrs
V	Fermentation technology: Application of Fermentation technology, Production of ergot alkaloids, single cell proteins, enzymes of pharmaceutical interest.	05 Hrs

REFERENCES (Latest Editions of)

1. Plant tissue culture, Bhagwani, vol 5, Elsevier Publishers.
2. Plant cell and Tissue Culture (Lab. Manual), JRMM. Yeoman.
3. Elements in biotechnology by PK. Gupta, Rastogi Publications, New Delhi.
4. An introduction to plant tissue culture by MK. Razdan, Science Publishers.
5. Experiments in plant tissue culture by John HD and Lorin WR., Cambridge University Press.
6. Pharmaceutical biotechnology by SP. Vyas and VK. Dixit, CBS Publishers.
7. Plant cell and tissue culture by Jeffrey W. Pollard and John M Walker, Humana press.
8. Plant tissue culture by Dixon, Oxford Press, Washington DC, 1985
9. Plant tissue culture by Street.
10. Pharmacognosy by G. E. Trease and WC. Evans, Elsevier.
11. Biotechnology by Purohit and Mathur, Agro-Bio, 3rd revised edition.
12. Biotechnological applications to tissue culture by Shargool, Peter D, Shargoal, CKC Press.
13. Pharmacognosy by Varo E. Tyler, Lynn R. Brady and James E. Robberrt, That Tjen, NGO.
14. Plant Biotechnology, Ciddi Veerasham.



ADVANCED PHARMACOGNOSY - II THEORY
(26L6.5-PHR- MPG 202T)

SCOPE

To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same. Study of herbal remedies and their validations, including methods of screening

COURSE OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- Validation of herbal remedies
- Methods of detection of adulteration and evaluation techniques for the herbal drugs
- Methods of screening of herbals for various biological properties

COURSE OUTCOMES

1. Knowledge about validation of herbal remedies.
2. Knowing methods of detection of adulteration and evaluation techniques for the herbal drugs.
3. Knowledge of screening methods of herbals for various biological properties.

UNIT	DETAILED SYLLABUS	Max. Hours:
		60
I	Herbal remedies – Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of Herbal medicine products, Validation of herbal therapies, Pharmacodynamic and Pharmacokinetic issues.	12 Hrs
II	Adulteration and Deterioration: Introduction, Types of Adulteration/ Substitution of Herbal drugs, Causes and Measures of Adulteration, Sampling Procedures. Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, detection of heavy metals, pesticide residues, phytotoxin, microbial contamination in herbs and their formulations.	12 Hrs
III	Ethnobotany and Ethnopharmacology: Ethnobotany in herbal drug evaluation, Impact of Ethnobotany in traditional medicine, New development in herbals, Bio-prospecting tools for drug discovery, Role of Ethnopharmacology in drug evaluation, Reverse Pharmacology.	12 Hrs
IV	Analytical Profiles of herbal drugs: <i>Andrographis paniculata</i> , <i>Boswellia serata</i> , <i>Coleus forskholii</i> , <i>Curcuma longa</i> , <i>Embellica officinalis</i> , <i>Psoralea corylifolia</i> .	12 Hrs

V

Biological screening of herbal drugs: Introduction and Need for Phyto-Pharmacological Screening, New Strategies for evaluating Natural Products, In vitro evaluation techniques for Antioxidants, Antimicrobial and Anticancer drugs. In vivo evaluation techniques for Anti-inflammatory, Antiulcer, Anticancer, Wound healing, Antidiabetic, Hepatoprotective, Cardio protective, Diuretics and Antifertility, Toxicity studies as per OECD guidelines.

REFERENCES (Latest Editions of)

1. Glimpses of Indian Ethano Pharmacology by P. Pushpangadam. Ulf Nyman. V. George Tropical Botanic Garden & Research Institute.
2. Natural products: A lab guide by Raphael Ikan, Academic Press.
3. Pharmacognosy - G. E. Trease and W.C. Evans. WB. Saunders Edinburgh, New York.
4. Pharmacognosy-Tyler, Brady, Robbers, Lee & Fetiger.
5. Modern Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I & II, Springer Publishers.
6. Herbal Drug Industry by RD. Choudhary, Eastern Publishers, New Delhi.
7. Text book of Pharmacognosy by C.K.Kokate, Purohit, Ghokhale, Nirali Prakashan.
8. Text Book of Pharmacognosy by T.E. Wallis, J & A Churchill Ltd., London.
9. Quality control of herbal drugs by Pulok K Mukherjee, Business Horizons Pharmaceutical Publishers, New Delhi.
10. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
11. Text book of Pharmacognosy and Phytochemistry by Vinod D. Rangarl, Part I & II, Career Publication, Nasik, India.
12. Plant drug analysis by H. Wagner and S. Bladt, 2nd edition, Springer, Berlin.
13. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol. I, Eastern PublisherS, New Delhi.
14. Herbal Medicine. Expanded Commission E Monographs, M. Blumenthal.

INDIAN SYSTEMS OF MEDICINE – THEORY
(26L6.5-PHR- MPG 203T)

SCOPE

To make the students understand thoroughly the principles, preparations of medicines of various Indian systems of medicine like Ayurveda, Siddha, Homeopathy and Unani. Also focusing on clinical research of traditional medicines, quality assurance and challenges in monitoring the safety of herbal medicines.

COURSE OBJECTIVES

After completion of the course, student is able to

- To understand the basic principles of various Indian systems of medicine
- To know the clinical research of traditional medicines, Current Good Manufacturing Practice of Indian systems of medicine and their formulations.

COURSE OUTCOMES

1. Explain the basic concepts, principles, history, and development of major Indian systems of medicine, including Ayurveda, Siddha, Unani, and Homoeopathy.
2. To understand the clinical research of traditional medicines, Current Good Manufacturing Practice of Indian systems of medicine and their formulations.

UNIT	DETAILED SYLLABUS	Max. Hours:
I	Fundamental concepts of Ayurveda, Siddha, Unani and Homoeopathy systems of medicine Different dosage forms of the ISM. Ayurveda: Ayurvedic Pharmacopoeia. Analysis of formulations and bio crude drugs with references to: Identity, purity and quality. Siddha: Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/Jeevam in Siddha system of medicine, Purification process (Suddhi).	60 12 Hrs
II	Naturopathy, Yoga and Aromatherapy practices a) Naturopathy - Introduction, basic principles and treatment modalities. b) Yoga - Introduction and Streams of Yoga. Asanas, Pranayama, Meditations and Relaxation techniques. c) Aromatherapy – Introduction, aroma oils for common problems, carrier oils.	12 Hrs
III	Formulation development of various systems of medicine	12 Hrs

	Salient features of the techniques of preparation of some of the important class of Formulations as per Ayurveda, Siddha, Homeopathy and Unani Pharmacopoeia and texts. Standardization, Shelf life and Stability studies of ISM formulations.	
IV	Schedule T – Good Manufacturing Practice of Indian systems of medicine. Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipment, standard operating procedures, health and hygiene, documentation and records. Quality assurance in ISM formulation industry - GAP, GMP and GLP. Preparation of documents for new drug application and export registration. Challenges in monitoring the safety of herbal medicines: Regulation, quality assurance and control, National/Regional Pharmacopoeias.	12 Hrs
V	TKDL, Geographical indication Bill, Government bills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU	12 Hrs

REFERENCES (Latest Editions of)

1. Ayurvedic Pharmacopoeia, The Controller of Publications, Civil Lines, Govt. of India, New Delhi.
2. Hand Book on Ayurvedic Medicines, H. Panda, National Institute of Industrial Research, New Delhi.
3. Ayurvedic System of Medicine, Kaviraj Nagendranath Sengupta, Sri Satguru Publications, New Delhi.
4. Ayurvedic Pharmacopoeia. Formulary of Ayurvedic Medicines, IMCOPS, Chennai.
5. Homeopathic Pharmacopoeia. Formulary of Homeopathic Medicines, IMCOPS, Chennai.
6. Homeopathic Pharmacy : An introduction & Hand book, Steven B. Kayne, Churchill Livingstone, New York.
7. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
8. British Herbal Pharmacopoeia, British Herbal Medicine Association, UK.
9. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Pulok K Mukharjee, Business Horizons, New Delhi.
10. Indian System of Medicine and Homeopathy in India, Planning and Evaluation Cell, Govt. of India, New Delhi.
11. Essential of Food and Nutrition, Swaminathan, Bappeco, Bangalore.
12. Clinical Dietetics and Nutrition, F.P. Antia, Oxford University Press, Delhi.
13. Yoga - The Science of Holistic Living by V.K. Yoga, Vivekananda Yoga Prakashna Publishing, Bangalore.

HERBAL COSMETICS – THEORY
(26L6.5-PHR- MPG 204T)

SCOPE

This subject deals with the study of preparation and standardization of herbal/natural cosmetics. This subject gives emphasis to various national and international standards prescribed regarding herbal cosmeceuticals.

COURSE OBJECTIVES

After completion of the course, student shall be able to,

- Understand the basic principles of various herbal/natural cosmetic preparations
- Current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

COURSE OUTCOMES

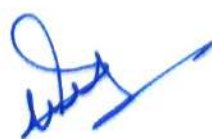
1. Understand the formulation principles, methods of preparation, and evaluation of different herbal cosmetic products..
2. Development of skills of current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

UNIT	DETAILED SYLLABUS	Max. Hours: 60
I	Introduction: Herbal/natural cosmetics, Classification & Economic aspects. Regulatory Provisions relation to manufacture of cosmetics: - License, GMP, offences & Penalties, Import & Export of Herbal/natural cosmetics, Industries involved in the production of Herbal/natural cosmetics.	12 Hrs
II	Commonly used herbal cosmetics, raw materials, preservatives, surfactants, humectants, oils, colors, and some functional herbs, preformulation studies, compatibility studies, possible interactions between chemicals and herbs, design of herbal cosmetic formulation.	12 Hrs
III	Herbal Cosmetics: Physiology and chemistry of skin and pigmentation, hairs, scalp, lips and nail, Cleansing cream, Lotions, Face powders, Face packs, Lipsticks, Bath products, soaps and baby product, Preparation and standardisation of the following: Tonic, Bleaches, Dentifrices and Mouth washes & Tooth Pastes, Cosmetics for Nails.	12 Hrs
IV	Cosmeceuticals of herbal and natural origin: Hair growth formulations, Shampoos, Conditioners, Colorants & hair oils, Fairness formulations, vanishing & foundation creams, anti-sun burn preparations, moisturizing creams, deodorants.	12 Hrs
V	Analysis of Cosmetics, Toxicity screening and test methods: Quality control	12 Hrs

and toxicity studies as per Drug and Cosmetics Act.

REFERENCES (Latest Editions of)

1. Panda H. Herbal Cosmetics (Hand book), Asia Pacific Business Press Inc, New Delhi.
2. Thomson EG. Modern Cosmetics, Universal Publishing Corporation, Mumbai.
3. P.P.Sharma. Cosmetics - Formulation, Manufacturing & Quality Control, Vandana Publications, New Delhi.
4. Supriya K B. Handbook of Aromatic Plants, Pointer Publishers, Jaipur.
5. Skaria P. Aromatic Plants (Horticulture Science Series), New India Publishing Agency, New Delhi.
6. Kathi Keville and Mindy Green. Aromatheraphy (A Complete Guide to the Healing Art), Sri Satguru Publications, New Delhi.
7. Chattopadhyay PK. Herbal Cosmetics & Ayurvedic Medicines (EOU), National Institute of Industrial Research, Delhi.
8. Balsam MS & Edward Sagarin. Cosmetics Science and Technology, Wiley Interscience, New York.



HERBAL COSMETICS - PRACTICALS-II
(26L6.5-PHR- MPG 205P)

1. Isolation of nucleic acid from cauliflower heads
2. Isolation of RNA from yeast
3. Quantitative estimation of DNA
4. Immobilization technique
5. Establishment of callus culture
6. Establishment of suspension culture
7. Estimation of aldehyde contents of volatile oils
8. Estimation of total phenolic content in herbal raw materials
9. Estimation of total alkaloid content in herbal raw materials
10. Estimation of total flavonoid content in herbal raw materials
11. Preparation and standardization of various simple dosage forms from Ayurvedic, Siddha, Homoeopathy and Unani formulary
12. Preparation of certain Aromatherapy formulations
13. Preparation of herbal cosmetic formulation such as lip balm, lipstick, facial cream, herbal hair and nail care products
14. Evaluation of herbal tablets and capsules
15. Preparation of sunscreen, UV protection cream, skin care formulations.
16. Formulation & standardization of herbal cough syrup.



SEMESTER-III

SEMESTER-III

RESEARCH METHODOLOGY & BIOSTATISTICS – THEORY
(26L7.0-PHR- MRM 301T)

SCOPE

This subject deals with the understanding of the basic concepts, principles, and types of research; identification of research problems; formulation of research objectives, research questions, and hypotheses; and planning and designing research studies using appropriate research designs and methodologies.

COURSE OBJECTIVES

- To understand the basic principles and concepts of research methodology in pharmaceutical sciences.
- To develop the ability to identify research problems, formulate research questions, and establish research objectives.

COURSE OUTCOMES

1. Understand CCSEA guidelines and SOPs related to animal handling.
2. Knowledge of various statistical techniques to solve statistical problems.
3. Understand basic strategies involved in Literature Survey, Hypothesis & Plagiarism.

UNIT	DETAILED SYLLABUS	Max. Hours: 60
I	General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.	12 Hrs
II	Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests (students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxon rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.	12 Hrs
III	Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.	12 Hrs
IV	CPCSEA guidelines for laboratory animal facility: Goals, veterinary care,	12 Hrs

	quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.	
V	Declaration of Helsinki: History, introduction, basic principles for all medical research and additional principles for medical research combined with medical care.	12 Hrs