

**ADMISSION & EXAMINATION
BYE-LAWS
FOR**

**MASTER OF PHARMACY
IN
PHARMACOGNOSY & PHYTOCHEMISTRY**

Program Code: MPG



**SCHOOL OF PHARMACEUTICAL EDUCATION AND RESEARCH
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CONTENTS

S NO	Topic	Page Number
1	BOS meeting details	
2	Vision and Mission Statements	
3	Programmed Educational Objectives	
4	Program Outcomes (PO)	
5	Consolidated semester wise programme details	
6	Rules and Regulations	
7	Course Design	

BOS MEETING DETAILS

- **Approval date of the BOS/School Board meeting for the present syllabus:**

Name of the program	Department	Board of School (BOS) Approval Date
M. Pharm	Pharmacognosy & Phytchemistry	21.04.2017

- **Approval date of the Academic Council meeting for the present syllabus**

Name of the program	Program Code	Dates of Revision
M. Pharm	MPG	31.05.2017

VISION AND MISSION STATEMENTS

Vision Statement: To create an atmosphere for quality education and research enabling students to excel in drug and drug delivery systems

Mission Statements:

MS 1: To support infrastructure for research through grants and industry academia interaction

MS 2: To provide an environment for the conduct of academic activities required to transform student's calibre.

MS 3: To create a learning environment where the faculty and students can discover, examine, embrace and comprehend technological changes for self-reliance.

MS 4: To strengthen education policies and programs for creating ideals representative of a democratic society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

After completion of the M. Pharm (Pharmaceutics), the post graduates will be able to:

PEO1: Apply knowledge in solving industry-relevant programs.

PEO2: Carry out quality research in different facets of the program including higher education.

PEO3: Foster abilities to design and fabricate new products or techniques, benefiting the society at large.

PEO4: Combine practical pharmaceutical knowledge and abilities with research ability for a better output.

PEO5: Inculcate entrepreneurial skills in aspiring pharmacy professionals

PEO6: Develop leadership skills to be applied in R&D, production and other facets of the profession

Mapping Program Educational Objectives (PEOs) with Mission Statements (MS)

	MS-1	MS-2	MS-3	MS-4
PEO-1	3	2	3	3
PEO-2	3	3	3	2
PEO-3	3	3	3	3
PEO-4	2	2	3	3
PEO-5	3	3	3	2
PEO-6	3	3	2	3

Level of Mapping: '3' is for 'high-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' mapping.

PROGRAMME SPECIFIC OUTCOME (PSO)

After completion of the M. Pharm (Pharmacognosy), the post graduates will be able to:

- PSO1:** Analyse different departments of the pharmaceutical industry like manufacturing, R&D, quality assurance, intellectual property rights and regulatory affairs
- PSO2:** Design and develop interfaces for entrepreneurship particularly in field of formulation research and development, pharmaceutical production, pharmaceutical consulting services, medicine sales, and distribution.
- PSO3:** Comprehend knowledge as drug analyst, research scientist, drug inspector and qualified teachers in the public and private organizations.

PROGRAM OUTCOMES (POs)

After going through the two years Master Program in Pharmaceutics, graduates will exhibit the ability to:

- PO1: Applied Pharmacy Knowledge:** Use knowledge of the fundamental elements in sync with updated technologies, tailored biopharmaceutical application and regulatory requirements pertaining to the development of innovative drug delivery systems.
- PO2: Research and development:** Utilize skills to create novel medicine delivery strategies for the available range of active therapeutic substances. Good understanding of the computer-based tools required for the product development research.
- PO3: Problem analysis:** Cultivate the problem solving skills that are generally encountered during pharmaceutical product development, including scale-ups and meeting the expectations of regulation by applying the concept of critical thinking and in-depth analysis.
- PO4: Modern tool usage:** Use latest product optimization tools along with statistical analysis during the novel product development, like computer aided drug design techniques and *in silico* studies.
- PO5: Communication:** Prepare quality documents, reports and effective presentation. Hone communication skills and the ability to successfully carry out obligations related to the development of knowledge in accordance with the demands of the academia and industry.
- PO6: Professional identity:** Create a profession that is dedicated to providing quality services that exceed the stakeholder's expectations like customers, industries, academia, regulatory bodies and to give direction and contribute to the improvement of services and technologies.
- PO7: Leadership skills:** Organize and execute the objectives related to research and development within a set timeline. Nurturing the skills from the beginning to manage and utilize the available resources judiciously.

PO8: Planning abilities: Implement the knowledge and skills for proper planning and running different steps which are involved in the time bound deliverables like R&D, production, regulatory submissions and product life cycle management.

PO9: Pharmaceutical ethics: Show a high level of morality, honesty and integrity. Implement ethical principles when drawing conclusions and accept responsibility for the repercussions is any.

PO10: Environmental sustainability: Use expertise and skills to solve the issues of environmental pollution, harmful industrial waste, along with wastage and also improve manufacturing processes while maintaining the sustainability practices.

PO11: Life-long learning: Readily engage in independent and ongoing learning processes in response to evolving needs and scientific advances. Using input from other professionals and identifying learning needs for life-long learning improvement. Recognize the importance of conferences, seminars, and workshops in the advancement of knowledge.

Mapping of Program Outcomes (POs) and Program Specific Outcomes (PSOs) with Program Educational Objectives (PEOs)

	PEO-1	PEO-2	PEO-3	PEO-4	PEO-5	PEO-6
PO-1	3	3	3	2	3	3
PO-2	2	2	3	3	2	3
PO-3	2	3	3	3	2	1
PO-4	3	3	3	2	1	2
PO-5	2	3	3	3	3	3
PO-6	2	3	3	2	3	3
PO-7	2	2	2	3	2	1
PO-8	2	2	3	3	3	3
PO-9	2	2	3	3	3	3
PO-10	3	2	3	3	2	1
PO-11	3	3	3	3	3	3
PSO-1	3	3	3	2	2	3
PSO-2	3	3	3	2	2	3
PSO-3	3	3	3	2	2	3

Level of Mapping: '3' is for 'high-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low-level' map

CONSOLIDATED SEMESTER WISE PROGRAMME DETAILS

Tables-I: Schemes for internal assessments and end semester examinations semester wise

Semester 1

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks	Credit points
		Continuous mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
MPG101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100	4
MPG102T	Advanced Pharmacognosy-1	10	15	1 Hr	25	75	3 Hrs	100	4
MPG103T	Phytochemistry	10	15	1 Hr	25	75	3 Hrs	100	4
MPG104T	Industrial Pharmacognostical Technology	10	15	1 Hr	25	75	3 Hrs	100	4
MPG105P	Pharmacognosy Practical I	20	30	6 Hrs	50	100	6 Hrs	150	6
-	Seminar/Assignment	-	-	-	-			100	4
	Total							650	26

Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks	Credit points
		Continuous Mode	Sessional Exams		Total	Marks	Duration		
			Marks	Duration					
MPG201T	Medicinal Plant biotechnology	10	15	1 Hr	25	75	3 Hrs	100	4
MPG102T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100	4
MPG203T	Indian system of medicine	10	15	1 Hr	25	75	3 Hrs	100	4
MPG204T	Herbal cosmetics	10	15	1 Hr	25	75	3 Hrs	100	4
MPG205P	Pharmacognosy Practical II	20	30	6 Hrs	50	100	6 Hrs	150	6
-	Seminar/Assignment							100	4
	Total							650	26

Semester III

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks	Credit points	
		Continuous Mode	Sessional Exams		Total	Marks			Duration
			Marks	Duration					
MRM 301T	Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100	4
-	Journal club	-	-	-	25		3 Hrs	25	1
-	Discussion / Presentation (Proposal Presentation)	-	-	-	50		3 Hrs	50	2
-	Research Work	-	-	-	-	350	1 Hrs	350	14
Total								525	21

* Non-University Exam

Semester IV

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks	Credit points	
		Continuous Mode	Sessional Exams		Total	Marks			Duration
			Marks	Duration					
-	Journal club	-	-	-	25	-	-	25	1
-	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75	16
-	Research work and Colloquium	-	-	-	-	400	1 Hr	400	3
Total								500	20

RULES AND REGULATIONS

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.

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 is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

8 Credit assignment

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.

9. 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 3 are distributed semester-wise as shown in Table 14. 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.

10. 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.

11. Course of study

The course of study for M. Pharm shall include Semester Wise Theory & Practical as given in Table– II-III. 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 –II-III

Table II-: Course of study for Semester I

Course code	Name of the course	No. of hours	Tutorial	Credit points
MPG101T	Modern Pharmaceutical Analytical Techniques	4	-----	4
MPG102T	Advanced Pharmacognosy-1	4	-----	4
MPG103T	Phytochemistry	4	----	4
MPG104T	Industrial Pharmacognostical Technology	4	----	4
MPG105P	Pharmacognosy Practical I	12	----	6
-	Seminar/Assignment	7	----	4
Total		35		26

Table III-: Course of study for Semester II

Course code	Name of the course	No. of hours	Tutorial	Credit points
MPG201T	Medicinal Plant biotechnology	4	-	4
MPG102T	Advanced Pharmacognosy-II	4		4
MPG203T	Indian system of medicine	4	-	4
MPG204T	Herbal cosmetics	4	-	4
MPG205P	Pharmacognosy Practical II	12	-	6
-	Seminar/Assignment	7	-	4
Total		35		26

Table-IV: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending	Minimum=02

Conference, Scientific Presentations and Other Scholarly Activities)	Maximum=07*
Total credit points	Minimum=95 Maximum=10*

* Credit Points for Co-curricular Activities

12. 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.

13. Examinations/Assessments

The scheme for internal assessment and end semester examinations is given in Table IV- VII

End Semester examinations

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

Internal assessment: Continuous mode

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

Table IV: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	Maximum Marks
Attendance (Refer Table – V)	8
Student – Teacher interaction	2
Total	10
Practical	
Attendance (Refer Table – V)	10
Based on Practical Records, Regular viva voce, etc.	10
Total	20

Table V: 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

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.

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.

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.

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.

Reexamination of end semester examinations

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

Table VI: Tentative schedule of end semester examinations

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

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.

Grading of performances

Letter grades and grade points allocations:

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

Table VII: 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.

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 C₁, C₂, C₃ and C₄ and the student’s grade points in these courses

are G₁, G₂, G₃ and G₄, 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:

Methodology adopted	150 Marks
Results and Discussions	250 Marks
Conclusions and Outcomes	50 Marks
Total	500 Marks

Evaluation of Presentation:

Presentation of work	100 Marks
Communication skills	50 Marks
Question and answer skills	100 Marks
Total	250 Marks

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.

Award of degree

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

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.

Revaluation I Re-totaling 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.

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.

SYLLABUS

M.PHARM. SEMESTER I

Course Code MPG 101T	Title of the course: Modern Pharmaceutical Analytical Techniques (MAT)
Course Code: MPG 102T	Title of the Course: Advanced Pharmacognosy-I (Theory)
Course Code: MPG 103T	Title of the Course: Phytochemistry (Theory)
Course Code: MPG 104T	Title of the Course: Industrial Pharmacognostical Technology (Theory)
Course Code: MPG 105P	Title of the Course: Pharmacognosy Phytochemistry Practical -1

Name of the Academic Program: M. Pharm Semester I (Pharmacognosy & Phytochemistry)

Course Code: MPG 102-T

Title of the Course: Advanced Pharmacognosy-I (Theory)

L-T-P: 4-0-0

Credits: 4

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students should be able to:

CO1: Recognize the significance of advances in cultivation and production of herbal drugs
(Cognitive level: Apply)

CO2: Identify source, composition and medicinal value of constituents and molecules derived from plants (Cognitive level: Understand)

CO3: Identify the health benefits of various nutraceuticals/medicinal plants (Cognitive level: Understand)

CO4: Apply concepts of pharmacovigilance and safety monitoring to traditional system based drugs (Cognitive level: Apply)

CO5: Discuss the significance of drugs of marine origin (Cognitive level: Understand)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	1		1							1		1	2	1
CO2	2		2	2		1	1			1	1	2	2		3
CO3	3	2	1	2	1			1	1		2	2		3	2
CO4	3	2	2		2	2			1			3	3		3
CO5	2	3	1		2		1			1	1	1	1	2	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus (Theory)

60 Hrs

1. 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

2. 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**

3. 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 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. **12 Hrs**

4. 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: Andrographolide, Glycolipids, Gugulipids, Withanolides, Vascine, Taxol
 - h) Miscellaneous **12 Hrs**

5. Pharmacovigilance of drugs of natural origin: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for bio drug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples. **12 Hrs**

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Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

Theory

There are two components of assessment: Internal assessment (25 marks) and End semester examination (75 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (15 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -8 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2 mark; 85-89: 4 marks; 90-94: 6 marks and 95-100: 8 marks), Academic activities

Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 30 marks and computed for 15 marks) and one improvement exam (30 marks and computed for 15 marks). The average marks of two best sessional exams are computed out of 15 marks.

Total Marks are 100 for the subject (Internal Assessment: 25 marks and End Semester Examination: 75 Marks)

Name of the Academic Program: M. Pharm Semester I (Pharmacognosy & Phytochemistry)

Course Code: MPG 103-T

Title of the Course: Phytochemistry (Theory)

L-T-P: 4-0-0

Credits: 4

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students shall be able to:

CO1: Explain different classes of phytoconstituents, their biosynthetic pathways, sources, extraction and medicinal properties (**Cognitive level: Understand**)

CO2: Describe general process of drug discovery and development from natural sources (**Cognitive level: Understand**)

CO3: Employ different methods of chromatography for developing fingerprint profiles for natural substance (**Cognitive level: Apply**)

CO4: Use spectroscopic methods for the determination of structures of small molecules of natural origin (**Cognitive level: Apply**)

CO5: Apply spectroscopic techniques like UV, IR, MS, NMR (^1H , ^{13}C) for Structure elucidation of the compounds (**Cognitive level: Apply**)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3		3							1		1	2	1
CO2	2		2	2		1	1			3	3	2	2		3
CO3	3	2	1	2	1			1	1		2	2		3	3
CO4	2	2	2		3	2			1			3	3		3
CO5	2	3	1		2		1			1	1	1	1	2	3

Each Course Outcome (CO) may be mapped with one or more program Outcomes (POs). Write '3' in the box for 'High-level' mapping, '2' for 'Medium-level' mapping, '1' for 'low-level' mapping

Detailed Syllabus:

THEORY

60 Hrs

- 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 phyto-pharmaceuticals containing drugs:
 - Alkaloids: Ephedrine, Quinine, Strychnine, Piperine, Berberine, Taxol, Vinca alkaloids.
 - Glycosides: Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Quercitin.
 - Steroids: Hecogenin, guggulosterone and withanolides

- d) Coumarin: Umbelliferone.
 e) Terpenoids: Cucurbitacins **12 Hrs**
- 2 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**
- 3 Extraction and Phytochemical studies: Recent advances in extractions with 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. **12 Hrs**
- 4 Phytochemical finger printing: HPTLC and LCMS/GCMS applications in the characterization of herbal extracts. Structure elucidation of phytoconstituents. **12 Hrs**
- 5 Structure elucidation of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (1H, 13C)
 a. Carvone, Citral, Menthol
 b. Luteolin, Kaempferol
 c. Nicotine, Caffeine iv) Glycyrrhizin. **12 Hrs**

REFERENCES (Latest Editions)

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 Medicinal 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 SV, Nagasampagi BA, Meenakshi S, Narosa Publishing House, New Delhi.

15. Pharmacognosy & Phytochemistry of Medicinal Plants, 2nd edition, Bruneton J, Interceptt Ltd., New York, 1999.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

Theory

There are two components of assessment: Internal assessment (25 marks) and End semester examination (75 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (15 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -8 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2 mark; 85-89: 4 marks; 90-94: 6 marks and 95-100: 8 marks), Academic activities

Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 30 marks and computed for 15 marks) and one improvement exam (30 marks and computed for 15 marks). The average marks of two best sessional exams are computed out of 15 marks.

Total Marks are 100 for the subject (Internal Assessment: 25 marks and End Semester Examination: 75 Marks)

Name of the Academic Program: M. Pharm semester I (Pharmacognosy & Phytochemistry)

Course Code: MPG 104T

Title of the Course: Industrial Pharmacognostical Technology (Theory)

L-T-P: 4-0-0

Credits: 4

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students should be able to:

CO-1: Explain the criteria and requirements for setting up the herbal/natural drug industry.

(Cognitive level: Understand)

CO-2: Discuss the guidelines for quality control of herbal/natural medicines. (Cognitive level: Understand)

CO-3: Discuss the guidelines for regulatory issues of herbal drugs (Cognitive level: Understand)

CO-4: Develop strategies for the patenting and IPR generation of herbals/natural drugs (Cognitive level: Apply)

CO-5: Utilise concept for the trade of raw materials and finished products of herbal drugs. (Cognitive level: Apply)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2		3			3			3	3	1	
CO2	3	2	3		2			2			3	3	2		2
CO3	3	2	3	2			2		1	2	3	3		2	
CO4	3		3							2	3	3			2
CO5	3	3	2	3					2	2	3	3			

Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low'-level' mapping.

Detailed Syllabus

60 Hrs

Unit-I

12 Hrs

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.

Unit-II**12 Hrs**

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.

Unit-III**12 Hrs**

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 pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

Unit-IV**12 Hrs**

Testing of natural products and drugs: Herbal medicines - 12 clinical laboratory testing. Stability testing of natural products, Hrs protocols.

Unit-V**12 Hrs**

Patents: Indian and international patent laws, proposed 12 amendments as applicable to herbal/natural products and Hrs 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.

Reference Books

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), Ist 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), IST Edition,

12. Drug Formulation Manual by D.P.S.Kohli and D.H.Shah (1998), Eastern Publisher, New Delhi.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

There are two components of assessment: Internal assessment (25 marks) and End semester examination (75 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (15 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -8 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2 mark; 85-89: 4 marks; 90-94: 6 marks and 95-100: 8 marks), Academic activities Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 30 marks and computed for 15 marks) and one improvement exam (30 marks and computed for 15 marks). The average marks of two best sessional exams are computed out of 15 marks.

Total Marks are 100 for the subject (Internal Assessment: 25 marks and End Semester Examination: 75 Marks)

Name of the Academic Program: M. Pharm. Sem I (Pharmacognosy & Phytochemistry)

Course Code: MPG 105P

Title of the Course: Pharmacognosy Practical-I

L-T-P: 0-0-12

Credits: 6

(L=Lecture hours, T= Tutorial hours, P: Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students should be able to:

CO1: Prepare different dosage forms of herbal drugs (**Cognitive level: Apply**)

CO2: Perform the isolation and identification of phytoconstituents from natural sources
(**Cognitive level: Apply**)

CO3: Identify the main/ active constitute of the medicinal plants and formulations (**Cognitive level: Understand**)

CO4: Apply concepts of spectroscopic analysis for the identification and characterization of natural products (**Cognitive level: Apply**)

CO5: Discuss the significance of compendial monographs of medicinal plants and products
(**Cognitive level: Understand**)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1		1							1		1	2
CO2	2		2	2		2	1			1	1	2	2	
CO3	3	2	1	2	1			1	2		2	2		3
CO4	3	2	2		2	2			1			3	3	
CO5	2	3	1		2		1			1	1	1	1	2

Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low'-level' mapping.

Detailed Syllabus

12/Week

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.

References:

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), Ist 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), IST Edition

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

Practical

There are two components of assessment: Internal assessment (50 marks) and End semester examination (100 marks). Internal assessment consists of continuous mode (20 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance- 10 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2.5 mark; 85-89:5 mark; 90-94: 7.5 marks and 95-100: 10 marks) and based on practical records, regular viva voce, etc. -10 marks. There are two Sessional exams (each conducted for 40 marks and computed for 30 marks) and one improvement exam (40 marks and computed for 30 marks). The average marks of two best sessional exams are computed out of 30 marks.

Total Marks are 150 for the subject (Internal Assessment: 50 marks and End Semester Examination: 100 Marks)

M.PHARM. SEMESTER II

Course Code MPG 201T	Title of the course: Medicinal Plant Biotechnology
Course Code: MPG 202T	Title of the Course: Advanced Pharmacognosy-II (Theory)
Course Code: MPG 203T	Title of the Course: Indian Systems of Medicine (Theory)
Course Code: MPG 204T	Title of the Course: Herbal Cosmetics (Theory)
Course Code: MPG 205P	Title of the Course: Pharmacognosy Phytochemistry Practical -II

Name of the Academic Program: M. Pharm semester II (Pharmacognosy & Phytochemistry)

Course Code: MPG 201T

Title of the Course: Medicinal Plant Biotechnology (Theory)

L-T-P: 4-0-0

Credits: 4

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students should be able to:

CO1: Explain significance of plant biotechnology in improving quality of medicinal plants
(Cognitive Level- understand)

CO2: Discuss various plant tissue culture techniques (Cognitive Level- understand)

CO3: Describe methods of production of secondary plant metabolites (Cognitive Level - apply)

CO4: Discuss plant genetic engineering and production of transgenics (Cognitive Level - apply)

CO5: Explain fermentation biotechnology (Cognitive Level- understand)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	1	2	2	3			3	3	2	
CO2	3	2	3								3	3	2		2
CO3	3	2	3	2	2	3		2	1	2	3	3			
CO4	3		3				1			2	3	3		1	3
CO5	3	3	2	3				3	2	2	3	3			

Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low'-level' mapping.

Detailed Syllabus

60 Hrs

Theory

1. 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**
2. 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. **12 Hrs**

- 3 Immobilisation 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 tissue cultures with emphasis on production of medicinal agents. Precursors and elicitors on production of secondary metabolites. **12 Hrs**
- 4 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. **12 Hrs**
- 5 Fermentation technology: Application of Fermentation technology, Production of ergot alkaloids, single cell proteins, enzymes of pharmaceutical interest. **12 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. Robberrrt, That Tjen, NGO.
14. Plant Biotechnology, Ciddi Veerasham.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

There are two components of assessment: Internal assessment (25 marks) and End semester examination (75 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (15 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -8 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than

80: 0 marks; 80-84: 2 mark; 85-89: 4 marks; 90-94: 6 marks and 95-100: 8 marks), Academic activities

Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 30 marks and computed for 15 marks) and one improvement exam (30 marks and computed for 15 marks). The average marks of two best sessional exams are computed out of 15 marks.

Total Marks are 100 for the subject (Internal Assessment: 25 marks and End Semester Examination: 75 Marks)

Name of the Academic Program: M. Pharm semester II (Pharmacognosy & Phytochemistry)

Course Code: MPG 202T

Title of the Course: Advanced Pharmacognosy II (Theory)

L-T-P: 4-0-0

Credits: 4

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students should be able to:

CO1: Explain Adulteration and Deterioration that occurs in herbal/natural drugs. (**Cognitive Level- Understand**)

CO2: Discuss validation of herbal remedies (**Cognitive Level- understand**)

CO3: Describe methods of detection of adulteration and evaluation techniques for the herbal drugs (**Cognitive Level - apply**)

CO4: Describe methods of screening of herbals for various biological properties (**Cognitive Level- apply**)

CO5: Explain Ethnobotany and Ethnopharmacology (**Cognitive Level- understand**)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	1	2	2	3			3	3	2	
CO2	3	2	3								3	3	2		2
CO3	3	2	3	2	2	3		2	1	2	3	3			
CO4	3		3				1			2	3	3		1	3
CO5	3	3	2	3				3	2	2	3	3			

Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low'-level' mapping.

Detailed Syllabus

Theory

60 Hrs

1. Herbal remedies – Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of Herbal medicine products, Validation of herbal therapies, Pharmacodynamic and Pharmacokinetic issues.
12 Hrs
2. 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**

- 3 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**

- 4 Analytical Profiles of herbal drugs: *Andrographis paniculata*, *Boswellia serata*, *Coleus forskholii*, *Curcuma longa*, *Embelica officinalis*, *Psoralea corylifolia*. **12 Hrs**

- 5 Biological screening of herbal drugs: Introduction and Need for Phyto-Pharmacological Screening, New Strategies for evaluating **12 Hrs**

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. RangarI, 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.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

There are two components of assessment: Internal assessment (25 marks) and End semester examination (75 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (15 marks). Continuous mode evaluation is of 10 marks comprising of Attendance - 8 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2 mark; 85-89: 4 marks; 90-94: 6 marks and 95-100: 8 marks), Academic activities

Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 30 marks and computed for 15 marks) and one improvement exam (30 marks and computed for 15 marks). The average marks of two best sessional exams are computed out of 15 marks.

Total Marks are 100 for the subject (Internal Assessment: 25 marks and End Semester Examination: 75 Marks)

Name of the Academic Program: M. Pharm semester II (Pharmacognosy & Phytochemistry)

Course Code: MPG 203T

Title of the Course: INDIAN SYSTEMS OF MEDICINE (Theory)

L-T-P: 4-0-0

Credits: 4

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students shall be able to:

CO1: Explain fundamental concepts of various Indian Systems of medicine (**Cognitive level: Understand**)

CO2: Describe regulatory aspects related to the cultivation of herbal ingredients and the manufacture and marketing of AYUSH drugs (**Cognitive level: Understand**)

CO3: Employ different techniques for the preparation and standardization of herbal formulations (**Cognitive level: Apply**)

CO4: Use physico-chemical methods for the analysis of ingredient herbs and herbal formulations (**Cognitive level: Apply**)

CO5: Explain Standardization, Shelf life and Stability studies of ISM formulations (**Cognitive level: Understand**)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	3	1	2	2	3			3	3	2	1
CO2	3	2	3								3	3			2
CO3	2	2		2	2	3		2	1	2					
CO4	3		3				1			2	3	3	2	1	3
CO5	2	3	2	3				3	2	2	3	3			

Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low'-level' mapping

Detailed Syllabus

THEORY

60 Hrs

1. 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).
12 Hrs

- 2 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
- 3 Formulation developments of various systems of medicine 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.

12 Hrs
- 4 Schedule T – Good Manufacturing Practice of Indian systems of medicine Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records. 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
- 5 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 Sengupata, 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, Bappco, Bangalore.

12. Clinical Dietitics 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.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

There are two components of assessment: Internal assessment (25 marks) and End semester examination (75 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (15 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -8 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2 mark; 85-89: 4 marks; 90-94: 6 marks and 95-100: 8 marks), Academic activities

Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 30 marks and computed for 15 marks) and one improvement exam (30 marks and computed for 15 marks). The average marks of two best sessional exams are computed out of 15 marks.

Total Marks are 100 for the subject (Internal Assessment: 25 marks and End Semester Examination: 75 Marks)

Name of the Academic Program: M. Pharm Semester II (Pharmacognosy & Phytochemistry)

Course Code: MPG 204T

Title of the Course: HERBAL COSMETICS (Theory)

L-T-P: 4-0-0 Credits: 4

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students should be able to:

CO-1: Discuss the basic principles of various herbal/natural cosmetic preparations (**Cognitive level: Understand**)

CO-2: Discuss the current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities (**Cognitive level: Understand**)

CO-3: Discuss the raw materials and its standards utilised for preparation of Herbal cosmetics (**Cognitive level: Understand**)

CO-4: Able to check quality of raw materials and analyse prepared cosmetic herbal formulations (**Cognitive level: Apply**)

CO-5: Utilise concept for development of different types of herbal cosmetic formulations. (**Cognitive level: Apply**)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3			2	2			2	3			3		1	
CO2	3					2					3	3	3		3
CO3	3	2	3	2			3		1	2	3	3			
CO4	3		3							2	3	3		2	2
CO5	3	3	2	3					2	2	3	3			

Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low'-level' mapping.

Detailed Syllabus

Unit-I

12 Hours

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.

Unit-II**12 Hours**

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.

Unit-III**12 Hours**

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.

Unit-IV**12 Hours**

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.

Unit-V**12 Hours**

Analysis of Cosmetics, Toxicity screening and test methods: 12 Quality control and toxicity studies as per Drug and Cosmetics Hrs Act.

Reference Books

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. KathiKeville and Mindy Green. Aromatherapy (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.

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

There are two components of assessment: Internal assessment (25 marks) and End semester examination (75 marks). Internal assessment consists of continuous mode (10 marks) and sessional examinations (15 marks). Continuous mode evaluation is of 10 marks comprising of Attendance -8 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2 mark; 85-89: 4 marks; 90-94: 6 marks and 95-100: 8 marks), Academic activities

Student teacher interaction-2 marks. There are two Sessional exams (each conducted for 30 marks and computed for 15 marks) and one improvement exam (30 marks and computed for 15 marks). The average marks of two best sessional exams are computed out of 15 marks.

Total Marks are 100 for the subject (Internal Assessment: 25 marks and End Semester Examination: 75 Marks)

Name of the Academic Program: M. Pharm-II Semester (Pharmaceutical Biotechnology)

Course Code: MPG 205T

Title of the Course: HERBAL COSMETICS PRACTICALS

L-T-P: 0-0-12

Credits: 6

(L=Lecture hours, T=Tutorial hours, P=Practical hours)

COURSE OUTCOMES (COs)

After completing this Course, the students should be able to:

CO1: Prepare different dosage forms of ISM drugs (**Cognitive level: Apply**)

CO2: Perform the isolation and identification of genetic materials from natural sources
(**Cognitive level: Apply**)

CO3: Compare quality of medicinal plants and formulations with the reference substances using standardization parameters (**Cognitive level: Analyse**)

CO4: Apply different analytical methods for the identification and characterization of phytochemicals in herbal raw materials (**Cognitive level: Apply**)

CO5: Explain the preparation and analysis of herbal cosmetics and aromatherapy formulations
(**Cognitive level: Understand**)

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1		1	2						1		1	2
CO2	2		2	2		2	1			1	1	2	2	
CO3	2	3	1	2	1	1		1	2		2	2		3
CO4	3	2	2		2	2		2	1			3	3	
CO5	2	3	1	1	2		1	3		1	1	1	1	2

Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write '3' in the box for 'High-level' mapping, 2 for 'Medium-level' mapping, 1 for 'Low'-level' mapping.

Detailed Syllabus

12 Hrs/Week

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.

References:

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), Ist Edition, Business horizons Robert Verpoorte, New Delhi.
3. Quality control of herbal drugs by Pulok K Mukharjee (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), IST Edition

Teaching-Learning Strategies in brief

The teaching learning strategies, followed are chalk-board teaching, learning through discussion among the peer group, classroom interaction, quiz, presentations, Q & A session and reflective learning.

Assessment methods and weightages in brief

Practical

There are two components of assessment: Internal assessment (50 marks) and End semester examination (100 marks). Internal assessment consists of continuous mode (20 marks) and sessional examinations (30 marks). Continuous mode evaluation is of 10 marks comprising of Attendance- 10 marks (calculated as: Percentage of Attendance: Allotment of marks- Less than 80: 0 marks; 80-84: 2.5 mark; 85-89:5 mark; 90-94: 7.5 marks and 95-100: 10 marks) and based on practical records, regular viva voce, etc. -10 marks. There are two Sessional exams (each conducted for 40 marks and computed for 30 marks) and one improvement exam (40 marks and computed for 30 marks). The average marks of two best sessional exams are computed out of 30 marks.

Total Marks are 150 for the subject (Internal Assessment: 50 marks and End Semester Examination: 100 Marks)
