॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड - ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० च्या अनुषंगाने शैक्षणिक वर्ष २०२३–२४ पासून संलग्न महाविद्यालये व विद्यापीठ संकुलांत पदव्युत्तर पदवी प्रथम वर्ष आणि विद्यापीठ संकुले व न्यू मॉडेल डिग्री कॉलेज मध्ये पदवी प्रथमवर्ष अभ्यासक्रम लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, शासन निर्णय क्र. एनईपी २०२०/प. क्र. ०९/विशि–३/शिकाना, दिनांक २० एप्रिल २०२३ व शासन पत्र. क्र एनईपी २०२०/प. क्र. ०९/विशि–३, दिनांक १६ जून २०२३ अन्वये सूचित केल्यानुसार राष्ट्रीय शैक्षणिक धोरण २०२०च्या अनुषंगाने दिलेल्या आराखडया नुसार दिनांक १६ जून २०२३ रोजी संपन्न झालेल्या मा. विद्यापरिषदेच्या बैठकीत ऐनवेळचा विषय क्र. ०५/५६–२०२३ अन्वये मान्यता दिल्यानुसार प्रस्तुत विद्यापीठाच्या विज्ञान व तंत्रज्ञान विद्याशाखा अंतर्गत खालील पदव्युत्तर पदवी अभ्यासक्रम (AICTE, PCL, BCI, CoA, NCTE इ. सारख्या नियमक संस्थाची मान्यता आवश्यक असलेले अभ्यासक्रम वगळून) संलग्न महाविद्यालये, विद्यापीठ परिसर व उपपरिसर संकुलांमध्ये आणि पदवी प्रथम वर्ष अभ्यासक्रम विद्यापीठ परिसर व उपपरिसर संकुले व विद्यापीठ संचलित न्यू मॉडेल डिग्री कॉलेज, हिंगोली येथे शैक्षणिक वर्ष २०२३–२४ पासून लागू करण्यात येत आहे.

1) M.Sc. Biotechnology (1st Year) - Campus School
2) M.Sc. Biotechnology (1st Year) – Affiliated colleges
3) B.Sc. Biotechnology (1st Year) – New Model Degree College, Hingoli
4) M.Sc. Botany (1st Year) - Campus School
5) M.Sc. Botany (1st Year) – Affiliated colleges
6) M.Sc. Herbal Medicine (1st Year) - Affiliated colleges
7) M.Sc. Chemistry (1st Year) - Campus School
8) M.Sc. Chemistry (1st Year) - Affiliated colleges
9) M.Sc. Computer Science / Computer Network / Computer Applications (1st Year) University campus, sub campus Latur
10) M.Sc. System Administration & Networking (1st Year) – Affiliated colleges
11) M.Sc. Computer Management (1st Year) – Affiliated Colleges
12) M.Sc. Computer Science (1st Year) – Affiliated Colleges
13) M.Sc. Dairy Science (1st Year) - Affiliated colleges
14) M.Sc. Electronic (1st Year) - Affiliated colleges
15) M.Sc. Geology (1st Year) – University Campus
16) M.Sc. Geography (1st Year) – University Campus
17) M.Sc. Applied Mathematics (1st Year) – Affiliated Colleges
18) M.Sc. Mathematics (1st Year) – Affiliated Colleges
19) M.Sc. Microbiology (1st Year) - University Campus
20) M.Sc. Microbiology (1st Year) – Affiliated colleges

21) M.Sc. Physics (1st Year) - University Campus
22) M.Sc. Physics (1st Year) – Affiliated Colleges
23) M.Sc. Statistics (1st Year) - University Campus
24) M.Sc. Statistics (1st Year) – Affiliated colleges
25) M.Sc. Biochemistry (1st Year) – Affiliated Colleges
26) M.Sc. Zoology (1st Year) – Affiliated Colleges

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी२०२०/S&T/अक/२०२३–२४/ 130

सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

दिनांक : ३०.०६.२०२३.

प्रत : १) मा. प्राचार्य, सर्व संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
२) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
३) मा. प्राचार्य, न्यु मॉडेल डिग्री कॉलेज हिंगोली.
४) मा. समन्यवक, कै. श्री उत्तमराव राठोड आदिवासी विकास व संशोधन केंद्र, किनवट.

प्रत माहितीस्तव :
१) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. कुलसचिव, प्रस्तुत विद्यापीठ.
३) मा. सर्व आधिष्ठाता, प्रस्तुत विद्यापीठ.
४) सर्व प्रशासकीय विभाग प्रमुख साहाय्यक, प्रस्तुत विद्यापीठ.
५) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY, NANDED - 431 606

Syllabus of

TWO YEAR MASTERS PROGRAMME IN SCIENCE

M.Sc. First Year

HERBAL MEDICINE

(For Affiliated Colleges)

Under the Faculty of

Science and Technology

Effective from Academic year 2023 – 2024

(As per NEP-2020)

Forward by the Dean, Faculty of Science and Technology

From the Desk of the Dean:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) and give freedom to affiliated Institutes to add few (PEO's) and course objectives and course outcomes tobe clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading systemis also introduced to ensure quality of engineering education.

Semester based Credit and Grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance. Credit assignment for courses is based on 15 weeks teaching learning process, however content of courses is to be taught in 12-13 weeks and remaining 3-2 weeks to be utilized for revision, guestlectures, coverage of content beyond syllabus etc.

Credit and grading based system was implemented for First Year of Engineering from the academic year 2012-2013. Subsequently this system will be carried forward for Second Year Engineering in the academic year 2013-2014, for Third Year and Final Year Engineering in the academic years 2014-2015 and 2015-2016 respectively.

Dr. L. M. Waghmare, Dean, Faculty of Science and Technology,
Dr. M. K. Patil, Associate Dean, Faculty of Science and Technology,
Swami Ramanand Teerth Marathwada University, Nanded

From Desk of Chairman, Board of Studies of the Subject Botany

PREAMBLE

Herbal medicine is the use of medicinal plant material which provides a safe and gentle treatment for a wide range of conditions. Herbal medicine is one of the oldest forms of medicine and is still used by 80% of the world's population. Herbal medicine is based on traditional uses of herbal remedies from many parts of the world, which have been confirmed and updated by scientific research. The proposed coursed will explore the maximum utilization of plant resources, extraction of active principles from medicinal plants in order to optimize a single chemical compound for treatment of diseases. The students enable to prepare different formulations from medicinal plants locally available. This course will provide a broader perspective to post graduate students intending to enter medicine or medically related fields including ethnobotany, herbal practice, medicinal chemistry, pharmacognosy etc. M. Sc. (Herbal Medicine) a PG course sanctioned by UGC, New Delhi under Innovative Program from 2012 to 2017. As this course has tremendous potential in the herbal industries this course is still continued for the benefit of the students to build up their carrier in the field of Herbal Medicine.

Salient Features: The syllabus of M. Sc. Herbal Medicine has been framed to meet the requirement of Choice based Credit System. The syllabus is framed as per the guidelines of NEP-2020. The papers offered here in this syllabus will train and orient the students in the field of Herbal Medicine. In the First semester papers are introduced to enhanced preliminary knowledge of Herbal Medicines. In semester second papers based on Instrumentation, phytochemical analysis, human diseases, molecular biology and pharmacognosy. In semester third and fourth papers are based on applied aspects of herbal medicines in which the papers like Herbal Drug Technology, Herbal Cosmetics and Standardization of Drugs are more important in industrial point of view. Elective papers are introduced in each and every semester. Laboratory course work is based on respective theory papers.

OBJECTIVES OF THE M SC HERBAL MEDICINE PROGRAMME:

1. To provide an updated education to the students at large in order to know the importance and scope of the Herbal Medicine.
2. To introduce recent advances in the subject and enable the students for current development in the subject.
3. To develop a scientific attitude among the students.
4. To develop an ability to work on their own and to make them fit for solving recent problems of society.

5. To develop skills and make them practical oriented to establish their own unit based on herbal medicine.
6. To aware the students for importance of medicinal plant species and their conservation.
7. To develop entrepreneurship among the students in the field of herbal medicines.
8. To develop the expertise in the field of herbal medicine in order to identify medicinal plant species and adulteration in herbal products.

PROGRAM SPECIFIC OUTCOMES (PSO) OF M.Sc. HERBAL MEDICINE:

This program will train and orient the students in the field of Herbal Medicine. The students will be placed in herbal based industries and research institutes. They can establish their own herbal industries. They can provide consultancy services for cultivation of medicinal plants, their processing and marketing. They can also get job in education institutes and universities.

PSO 1: This program will train and orient the students for job opportunities in Herbal Medicine

PSO 2: This program will also generate human resource for Phytochemical laboratories, Pharmaceutical industries, Herbal industries and Research in Herbal Medicine.

PSO 3: This program will also generate human resources for medicinal plant sector, Herbal cosmetics.

PSO 4: This program will generate expertise in the field of Medicinal botany.

Dr. Saheb Laxmanrao Shinde
Chairman, Board of Studies of the Botany
Swami Ramanand Teerth Marathwada University,
Nanded

Details of the Board of Studies Members in the subject Botany under the faculty of Science & Technology of S.R.T.M. University, Nanded

Sr No	Name of the Member	Designation	Address	Contact No.
1.	Dr. Saheb Laxmanrao Shinde	Chairman	Yeshwant Mahavidylaya, Nanded	7588151967
2	Dr. Babasaheb Shivmurti Surwase	Member	School of Life Sciences, S.R.T.M.U. Nanded	9075829767
3	Dr. B. D. Gachande	Member	Science College, Nanded	8788727840
4	Dr Vijay Tulshiram Gorgile	Member	Shahir Annabhau Sathe Mahavidyalaya, Mkhed	9421762073
5	Dr. Sudhakar V. Chate	Member	Shivaji College, Udgir	8421241300
6	Dr. Suresh Manoharrao Telang	Member	Yeshwant Mahavidyalaya, Nanded	9822174684
7	Dr. R. M. Kadam	Member	M. G. M. Ahmedpur, Tq. Ahmedpur, Dist. Latur.	9422657976
8	Dr. Sopan Dnyanoba Dhavale	Member	Shahir Annabhau Sathe Mahavidyalaya, Mukhed,	9423614703
9.	Dr. Sanjay Marotrao Dalvi	Member	Shri Guru Buddhiswami Mahavidyalaya, Purna (Jn),	9921101210
10	Dr. Prashant A. Gawande	Professor from other University	Sant Gadge Baba Amravati University,Amravati.	9403622568
11	Dr. Ambadas Sheshrao Kadam	Experts	DSM College Parbhani.	8329151172
12	Dr. Kanhaiya Ranganathrao Kadam	Experts	K.K. Herbal Industries, Gut No. 252, Naleshwar Road, Limbgaon, Nanded.	9420261080
13	Bindu Maurya	Experts	07, Mangal Pravesh building Plot. C-16 Sector-3 Airoli, Navi Mumbai.	9987591561
14	Shri Bhanudas Balajirao Pendkar	Experts	K-Ferts Lab, W-4, MIDC Industrial Area, Nanded. Invitee Member	8888896710
15	Dr. D. M. Jadhav	Invitee Member	Science College Nanded	9423413350

16	**Dr. S. A. Patil**	**Invitee Member**	**Yeshwant Mahavidyalaya Nanded**	**9356596159**
17	**Dr. Marathe V. R.**	**Invitee Member**	**Science College Nanded**	**7588565395**
18	**Dr. Patil R.B.**	**Invitee Member**	**Shankarrao Chavan Mahavidyalaya, Ardhapur.**	**8208088702**
19	**Narlawar Shivani Sanjay**	**PG Student**	**C/o Science College Nanded**	**9146042070**
20	**Tamkinat Begum Mirza Irshad Saleem**	**UG Student**	**C/o Yeshwant Mahavidyalaya, Nanded**	**9403951262**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Credit Framework for Two Year PG Program

Subject: HERBAL MEDICINE

Year & Level 1	Sem. 2	Major Subject (DSC) 3	Major Subject (DSE) 4	RM 5	OJT / FP/ CS 6	Research Project 7	Practicals 8	Credits 9	Total Credits 10
1	1	**SHMC401 (4 Cr)** **SHMC402 (4 Cr)** **SHMC403 (4 Cr)**	**SHME401** (3+1 Cr)	**SVECR 401** *Research Methodology* **(3 Cr)**	--		**SHMP401 (1Cr)** **SHMP402 (1Cr)** **SHMP403 (1Cr)** **SHMEP401 (1Cr)**	**22**	**44**
	2	**SHMC451 (4 Cr)** **SHMC452 (4 Cr)** **SHMC453 (4 Cr)**	**SHME451** (3+1 Cr)	---	**SHMOJ 451/** **SHMFP 451/** **SHMCS 451** **(3 Cr)**	--	**SHMP451 (1Cr)** **SHMP452 (1Cr)** **SHMP453 (1Cr)** **SHMEP451 (1Cr)**	**22**	
Exit option: Exit Option with PG Diploma *(after 2024-25)*									
2	3	**SHMC501 (4 Cr)** **SHMC502 (4 Cr)** **SHMC503 (4 Cr)**	**SHME501 (3+1 Cr)** ***(From same Department / School)***	--		Research Project **SDSCR551 (4Cr)**	**SHMP501 (1 Cr)** **SHMP502 (1 Cr)** **SHMEP501 (1 Cr)**	**22**	**44**
	4	**SHMC551 (4 Cr)** **SHMC552 (4 Cr)**	**SHME551 (3+1 Cr)** ***(From same Department / School)***	**SVECP 551** Publication Ethics (2 Cr)		Research Project **SDSCR552** **(6 Cr)**	**SHMP551 (1Cr)** **SHMP552 (1Cr)** **SHMEP551 (1Cr)**	**22**	
Total Credits		**44**	**16**	**05**	**03**	**10**	**10**	**88**	

M. Sc. First Year Semester I *(Level 6.0)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	**SHMC401**	Indian System of Medicines	04	--	**04**	04	--
	SHMC402	Taxonomy and anatomy of Medicinal Plants	04	--	**04**	04	--
	SHMC403	Biochemistry and Plant Metabolism	04	--	**04**	04	--
Elective (DSE)	**SHME401**	Cultivation, Properties and Utilization of Medicinal Plants	03	--	**03**	03	--
Research Methodology	**SVECR401**	Research Methodology	03	--	**03**	03	
DSC Practical	**SHMP401**	Lab 1 / Based on theory Paper SHMC401	--	01	**01**	--	02
	SHMP402	Lab 2/ Based on theory Paper SHMC402	--	01	**01**	--	02
	SHMP403	Lab 3/ Based on theory Paper SHMC403	--	01	**01**	--	02
DSE Practical	**SHMEP401**	Elective Lab/ Based on Elective Paper SHME401	--	01	**01**	--	02
Total Credits			**18**	**04**	**22**	**18**	**08**

M. Sc. First Year Semester I *(Level 6.0)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits of individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)	CA (8)	ESA (9)	
Major	**SHMC401**	Indian System of Medicines	20	20	20	**80**	--	--	**100**
	SHMC402	Taxonomy and anatomy of Medicinal Plants	20	20	20	**80**	--	--	**100**
	SHMC403	Biochemistry and Plant Metabolism	20	20	20	**80**	--	--	**100**
Elective (DSE)	**SHME401**	Cultivation, Properties and Utilization of Medicinal Plants	15	15	15	**60**	--	--	**75**
Research Methodology	**SVECR401**	Research Methodology	15	15	15	**60**	--	--	**75**
DSE Practical	**SHMP401**	Lab 1 / Based on theory Paper SHMC401	--	--	--	--	05	20	**25**
	SHMP402	Lab 2/ Based on theory Paper SHMC402	--	--	--	--	05	20	**25**
	SHMP403	Lab 3/ Based on theory Paper SHMC403	--	--	--	--	05	20	**25**
DSE Practical	**SHMEP401**	Elective Lab/ Based on Elective Paper SHME401	--	--	--	--	05	20	**25**

M. Sc. First Year Semester II *(Level 6.0)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	**SHMC451**	Instrumentation and Modern analytical techniques	04	--	**04**	04	--
	SHMC452	Microbiology and Pathology of Human Diseases	04	--	**04**	04	--
	SHMC453	Molecular Biology and Genetic Engineering	04	--	**04**	04	--
Elective (DSE)	**SHME451**	Fundamentals of Pharmacognosy	03	--	**03**	03	--
On Job Training / Field Project / Case Study	**SHMOJ 451/ SHMFP 451/ SHMCS 451**	On Job Training (OJ) / Field Project (FC) / Case Study (CS)		03	**03**		03
DSC Practical	**SHMP451**	Lab 1 / Based on theory Paper SHMC451	--	01	**01**	--	02
	SHMP452	Lab 2/ Based on theory Paper SHMC452	--	01	**01**	--	02
	SHMP453	Lab 3/ Based on theory Paper SHMC453	--	01	**01**	--	02
DSE Practical	**SHMEP451**	Elective Lab/ Based on Elective Paper SHME451	--	01	**01**	--	02
Total Credits			**15**	**07**	**22**	**15**	**11**

M. Sc. First Year Semester II *(Level 6.0)*

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits of individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)	CA (8)	ESA (9)	
Major	**SHMC451**	Instrumentation and Modern analytical techniques	20	20	20	**80**	--	--	**100**
	SHMC452	Microbiology and Pathology of Human Diseases	20	20	20	**80**	--	--	**100**
	SHMC453	Molecular Biology and Genetic Engineering	20	20	20	**80**	--	--	**100**
Elective (DSE)	**SHME451**	Fundamentals of Pharmacognosy	15	15	15	**60**	--	--	**75**
On Job Training / Field Project / Case Study	**SHMOJ 451/ SHMFP 451/ SHMCS 451**	On Job Training (OJ) / Field Project (FC) / Case Study (CS)	15	15	15	**60**	--	--	**75**
DSE Practical	**SHMP451**	Lab 1 / Based on theory Paper SHMC451	--	--	--	--	05	20	**25**
	SHMP452	Lab 2/ Based on theory Paper SHMC452	--	--	--	--	05	20	**25**
	SHMP453	Lab 3/ Based on theory Paper SHMC453	--	--	--	--	05	20	**25**
DSE Practical	**SHMEP451**	Elective Lab/ Based on Elective Paper SHME451	--	--	--	--	05	20	**25**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science and Technology

NEP- 2020
SEMESTER PATTERN
Two Year (PG) Program

HERBAL MEDICINE- CURRICULUM

With effect from
Academic Year 2023-2024

M. Sc. FIRST YEAR
SEMESTER – I
BOTANY

JUNE, 2023

M. Sc. FIRST YEAR HERBAL MEDICINE CURRICULUM
Semester-I

SHMC401: INDIAN SYSTEM OF MEDICINES

Major-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMC401	Indian System of Medicines	04	--	04	--	04

Major-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMC401	Indian System of Medicines	20	20	20	80	--	--	100

SHMC401: INDIAN SYSTEM OF MEDICINES

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To study and impart knowledge about the different systems of medicines of India
2. To inspire students to know the importance of various systems

Course outcomes:

1. Understand the different dosage forms, Methods of preparation of different types of medcines.

2. To know the difference between various systems of medicines

Curriculum Details: SHMC401: INDIAN SYSTEM OF MEDICINES

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**AYURVEDIC SYSTEM OF MEDICINE**	**15**
	1.1	Historical aspects, Principles with merits and demerits,	
	1.2	Introduction on different dosage forms, Methods of preparation of Ayurvedic medicines,	
	1.3	Standardization of Ayurvedic medicines	
	1.4	Problems in Standardization of ayurvedic medicines	
2.0		**UNANI SYSTEM OF MEDICINE**	**15**
	2.1	Historical aspects, Principles with merits and demerits,	
	2.2	Introduction on different dosage forms, Method of preparation of Unani medicines,	
	2.3	Standardization of Unani medicines	
	2.4	Problems in Standardization of Unani medicine.	
3.0		**HOMEOPATHY SYSTEM OF MED**	**15**
	3.1	Historical aspects, Principles with merits and demerits	
	3.2	Introduction on different dosage forms, Method of preparation of Homeopathic medicines,	
	3.3	Standardization of Homeopathic medicines	
	3.4	Problems in Standardization of Homeopathic medicine.	
4.0		**SIDDHA AND TRIBAL SYSTEM OF MEDICINES**	**15**
	4.1	History, Principles with merits and demerits	
	4.2	Introduction on different dosage forms, Method of preparation of Siddha medicine.	
	4.3	Principles, Importance, Merits and Demerits of Tribal Medicines, Rules and Regulations to Safeguard the Complimentary Medicines.	
	4.4	History, Principles, Introduction and Methods of Naturopathy.	
		Total	**60**

SELECTED READINGS:

1. Ayurvedic Pharmacopoeia.
2. Ayurvedic Formulary of India, the Indian Medical Practitioners Co-operative Pharmacy and Stores Ltd, IMPCOPS.
3. Hand Book on Ayurvedic Medicines, H.Panda National Institute of Industrial Research, Delhi-7.
4. Ayurvedic system of medicine, 2nd edition, Kaviraj, Nagendranath Sengupata, vol. I &II.

Unani Pharmacopoeia.

SHMC402: TAXONOMY AND ANATOMY OF MEDICINAL PLANTS

Major-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMC402	Taxonomy and anatomy of Medicinal Plants	04	--	04	--	04

Major-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMC402	Taxonomy and anatomy of Medicinal Plants	20	20	20	80	--	--	100

SHMC402: TAXONOMY AND ANATOMY OF MEDICINAL PLANTS

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To study and impart knowledge about the occurrence, distribution and characters of different families of Angiosperms
2. To inspire students to study diversity and anatomy of Angiospems

Course outcomes:

1. Understand the morphology, characters and importance of the various families of angiospems.
2. Learn the skill for the Identification of plants
3. Understand the anatomical features of plants

Curriculum Details: SHMC402: TAXONOMY AND ANATOMY OF MEDICINAL PLANTS

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**GENERAL PRINCIPLES OF TAXONOMY**	**15**
	1.1	Introduction – Definition, aims and objectives of taxonomy,	
	1.2	Species Concept: Typological, Taxonomical, Biological concept of species.	
	1.3	Botanical Nomenclature: Salient features of International Code of Nomenclature for algae, fungi and plants (ICNafp),	
	1.4	ICNafp: Principles, articles and recommendations	
2.0		**TAXONOMIC EVIDENCES AND CLASSIFICATIONS**	**15**
	2.1	Taxonomic evidence: morphology, cytology, palynology, phytochemistry,	
	2.2	Taxonomic tools: herbarium, floras, botanical gardens, use of keys in plant identification.	
	2.3	Systems of angiosperms classification: Broad outline of Bentham and Hooker classification with merits and demerits.	
	2.4	Systems of angiosperms classification: Broad outline of Engler and Prantl's and Hutchinson's system of classification with merits and demerits.	
3.0		**STUDY OF FAMILIES**	**15**
	3.1	Comparative account of following Angiospermic families as per Bentham and Hooker's system with their medicinal values: Meliaceae and Malvaceae	
	3.2	Comparative account of following Angiospermic families as per Bentham and Hooker's system with their medicinal values: Verbenaceae and Asteraceae	
	3.3	Comparative account of following Angiospermic families as per Bentham and Hooker's system with their medicinal values: Lamiaceae and Solanaceae	
	3.4	Comparative account of following Angiospermic families as per Bentham and Hooker's system with their medicinal values: Zingiberaceae and Liliaceae	
4.0		**ANATOMY OF MEDICINAL PLANTS**	**15**
	4.1	Introduction, importance and scope of anatomy of plants. Organization of root apical meristem (RAM),	
	4.2	Lateral root and root hairs. Organization of shoot apical meristem (SAM). Cytological and molecular aspects of SAM.	
	4.3	Vascular tissue differentiation- Xylem and phloem.	

	4.4	Secretary tissues: types and importance, Structure and types of stomata and trichomes. Role of anatomy in taxonomy.	
		Total	**60**

SELECTED READINGS:

1. Davis P. H. and Heywood V.H. (1993) – Principles of Angiosperms Taxonomy Tobert E. Kreigher Pub. Co. New York
2. Grant. V. (1971) – Plant Speciation – Columbia University Press New York.
3. Harrison, H.J. (1971) – New concepts in flowering plant Taxonomy – Hieman Educational Books Ltd. London
4. Heslop – Harrison J. (1967) – Plant Taxonomy- English Language Book Soc. And Edward Arnold Pub. Ltd. UK.
5. Hey wood. V.H. and Moore D.M. (1984) – Current concepts in plant Taxonomy, Academic press, London.
6. Jones A.D. and Wilbins, A.D. (1971) – Variation and adaptations in plant species. Hieman & Co-Educational Books Ltd. London.
7. Jones S.B. Jr. and Luchsinger, A.E. (1986) – Plant systmatics (2nd edition) Mc Graw Hill Book Co., New York.
8. Nordenstam, B.EL Gazaly, G. and Kassas, M. Zoo – Plant systematic for 21st Century. Portland press Ltd. London.
9. Radford, A.E. (1986) – Fundamentals of plant systematics – Harper & Row Publications, USA.
10. Stebbins G.L. (1974) – Flowering plant Evolution Above species level – Edward Arnold Ltd., London.
11. Takhtajan A.L. (1997) Diversity and classification of flowering plant – Colubia University, press New York.
12. Woodland, D.W. (1991) – Contemporary plant systematics : Pentice Hall, New Jersey.
13. Flora of Osmanabad – V. N. Naik.
14. Flora of Marathwada – Chief Ed. By Dr. V.N. Naik.
15. Plant Anatomy – B. P. Pande
16. Plant Anatomy – M. S. Tayal

SHMC403: BIOCHEMISTRY AND PLANT METABOLISM

Major-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMC403	Biochemistry and Plant Metabolism	04	--	04	--	04

Major-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA						
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)	ESA (7)	CA(8)	ESA(9)	
SHMC403	Biochemistry and Plant Metabolism	20	20	20	80	--	--	100

SHMC403: BIOCHEMISTRY AND PLANT METABOLISM

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To study and impart knowledge about the biochemical basis of plant life.
2. To inspire students to know different metabolic activities of plants

Course outcomes:

1. Understand the mechanism of biosynthesis of different metabolits of plants.
2. Learn about the importance of nitrogen, amino acids, proteins and enzymes.

Curriculum Details: SHMC403: BIOCHEMISTRY AND PLANT METABOLISM

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**CARBOHYDRATES AND LIPID METABOLISM**	**15**
	1.1	Carbohydrates in Biosphere, properties, functions and importance	
	1.2	Carbohydrate Metabolism: Biosynthesis of starch and sugars, catabolic pathways, interaction between Hexose Pentose Phosphate and Triose phosphate pools.	
	1.3	Lipid Metabolism: Classification, structure and function of lipids, biosynthesis of fatty acids, membrane lipids, structural lipids and storage lipids.	
	1.4	Catabolism of storage lipids, phospholipids and derived lipids (steroids).	
2.0		**SECONDARY METABOLITES**	**15**
	2.1	Study of following secondary plant metabolites with respect to their chemistry, Biosynthesis, and biological activity- Flavonoids, Simple Phenolics, Phenolic Glycosides,	
	2.2	Study of following secondary plant metabolites with respect to their chemistry, Biosynthesis, and biological activity- Tannins, Anthroquinones, Saponins,	
	2.3	Study of following secondary plant metabolites with respect to their chemistry, Biosynthesis, and biological activity- Steroids, Alkaloids, Pigments (anthocyanin and betacyanin),	
	2.4	Study of following secondary plant metabolites with respect to their chemistry, Biosynthesis, and biological activity- Resins, Gums and Volatile oils.	
3.0		**NITROGEN AND SULPHUR METABOLISM**	**15**
	3.1	Nitrogen Metabolism: Overview of nitrogen fixation,	
	3.2	Ammonia uptake and reduction, nitrite reduction, Nitrogen Cycle.	
	3.3	Sulphur Metabolism: Sulphur chemistry and fixation, uptake and transport, reductive sulphate assimilation pathways,	
	3.4	Synthesis and function of glutathione and its derivatives, Sulphur Cycle.	
4.0		**AMINO ACIDS AND ENZYMES**	**15**
	4.1	Amino Acids: Structure, Classification and various physicochemical properties. Essential and non essential amino acids. Transamination, Deamination.	
	4.2	Structure of proteins (Primary, secondary, tertiary, quaternary and domain structure)	
	4.3	Enzymology: Introduction, Classification, properties and structure	

		of enzyme, active site,	
	4.4	Enzyme kinetics, Michaelis Menten equation, Significance of Km and V-max Enzyme inhibition, allosteric enzymes, Coenzymes, relation between co-enzymes, vitamins, co-factors.	
		Total	**60**

SELECTED READINGS:

1. Plant Physiology, Fourth Edition (1991) F. Salisbury and C. Ross, Brooks Cole Publisher.
2. Plant Physiology, Fourth Edition (2006) L. Taiz and E. Zeiger, Sinauer Associates Inc.
3. Plant Physiology, Biochem,istry and biotechnology – Jain and Jain
4. Plant Physiology – Williams Hopkins
5. Plant Physiology – Teiz and Jiegger
6. Plant Physiology – Devlin
7. Plant Physiology – Salisburry and Ross.
8. Chemistry of Organic Natural Products (Vol.-1 & 2) by O.P. Agarwal.
9. Organic Chemistry of Natural Products (Vol.-1 & 2) by Gurdeep Chatwal.
10. Organic Chemistry (Vol.-2) by I.L. Finar.
11. Lehninger's Principles of Biochemistry – Nelson and Cox
12. Biochemistry – Satyanarayan
13. Biochemistry – A. C. Deb Fundamentals of Biochemistry – J. L. Jain

SHME401: CULTIVATION, PROPERTIES AND UTILIZATION OF MEDICINAL PLANTS

Elective -Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHME401	Cultivation, Properties and Utilization of Medicinal Plants	03	--	03	--	03

Elective -Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA						
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)	ESA (7)	CA(8)	ESA(9)	
SHME401	Cultivation, Properties and Utilization of Medicinal Plants	15	15	15	60	--	--	75

SHME401: CULTIVATION, PROPERTIES AND UTILIZATION OF MEDICINAL PLANTS

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To study and impart knowledge about the method of cultivation of different medicinal plants.
2. To inspire students for cultivation and marketing of medicinal and aromatic plants

Course outcomes:

1. Understand the nutritional requirement of medicinal plant cultivation.
2. Learn the pharmacognostic properties of medicinal plants to avoid adulteration.

Curriculum Details: SHME401: CULTIVATION, PROPERTIES AND UTILIZATION OF MEDICINAL PLANTS

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**CULTIVATION OF MEDICINAL PLANTS**	**15**
	1.1	Origin and methods of Cultivation, Storage, Marketing and utilization of Safed Musali, Turmeric, Awala	
	1.2	Cultivation of Plants: Soil and Climate, Field preparation,	
	1.3	Propagation: (a) Raising of Nursery (b) Planting, Irrigation, Fertilizer Application, Intercultural, Harvesting and Yield Studies	
	1.4	Export of medicinally important plants (General aspects).	
2.0		**STUDY OF AROMATIC PLANTS**	**15**
	2.1	Studies of following aromatic plants (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing) : *Mentha, Coriandrum*	
	2.2	Studies of following aromatic plants (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing) : *Ocimum, Cymbopogon*	
	2.3	Studies of following aromatic plants (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing) : *Geranium, Eucalyptus*	
	2.4	Studies of following aromatic plants (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing) : *Cardamom, Cymbopogon*	
3.0		**STUDY OF MEDICINAL PLANTS (DICOTYLEDONES)**	**15**
	3.1	Pharmacognostic Studies of following drug plants (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing) : *Commiphora weightii*,	
	3.2	Pharmacognostic Studies of following drug plant (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing): *Withania somnifera*.	
	3.3	Pharmacognostic Studies of following drug plant (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing): *Terminalia arjuna* and *Rauwolfia surpentina*	
	3.4	Pharmacognostic Studies of following drug plant: (Classification, Chemical properties, Uses, Adultrants, cultivation, Storage and Marketing): *Justicia adhatoda.*	
4.0		**STUDY OF MEDICINAL PLANTS ((MONOCOTYLEDONES)**	**15**
	4.1	Pharmacognostic studies of following drug plants (Classification, Chemical properties, Uses, Adultrants, Cultivation, Storage and Marketing): *Aloe vera*	
	4.2	Pharmacognostic studies of following drug plants (Classification, Chemical properties, Uses, Adultrants, Cultivation, Storage and	

		Marketing): *Asparagus racemosus*	
	4.3	Pharmacognostic studies of following drug plants (Classification, Chemical properties, Uses, Adultrants, Cultivation, Storage and Marketing): *Gloriosa superba*	
	4.4	Pharmacognostic studies of following drug plants (Classification, Chemical properties, Uses, Adultrants, Cultivation, Storage and Marketing): *Curcuma longa, Cyperus rotundus,*	
		Total	**60**

SELECTED READINGS:

1. Chadha, K.L. 2001. Hand Book of Horticulture. ICAR Publication, Krishi AnusandhanBhavan, Pusa, New Delhi.
2. Farooqi, A.A. and B.S. Sreeramu. 2001. Cultivation of Medicinal and Aromatic Crops. Universities Press (India) Ltd.3-5-819, Hyderguda, Hyderabad - 29.
3. H. Panda.Aromatic Plants Cultivation, Processing and Uses, Asia Pacific Business Press Inc.
4. 4. Handa, S.S. and M.K. Kaul. 1987. Cultivation and Utilization of Medicinal Plants. RRL, Jammu.
5. Kumar, N., J.B. Md. Abdul Khadar, P. Rangaswamy and I. Irulappan. 1982. Introduction to spices, plantation crops, medicinal and aromatic plants. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Kumar, N., J.B. Md. Abdul Khadar, P. Rangaswamy and I. Irulappan. 1982. Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Planters Chronicle. Monthly Publication. UPASI, Coonoor.
8. Shanmugavelu, K.G., N. Kumar and K.V. Peter. 2002. Production Technology of Spices and Plantation Crops. Agrobios Publications, Bikenar, Rajasthan.

SVECR401: RESEARCH METHODOLOGY

Research Methodology -Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SVECR401	Research Methodology	03	--	03	--	03

Research Methodology-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA						
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)	ESA (7)	CA(8)	ESA(9)	
SVECR401	Research Methodology	15	15	15	60	--	--	75

SVECR401: RESEARCH METHODOLOGY

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To learn and practice the literature survey aspects of projects and prepare the scope and goals for the proposed project.
2. To learn, practice and improve the research presentation skills and with latest tools

Course outcomes:

1. Develop the ability to apply the methods while working on a research project work
2. Develop a appropriate framework for research studies

Curriculum Details: SVECR401: RESEARCH METHODOLOGY

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**INTRODUCTION OF RESEARCH -I**	**12**
	1.1	Introduction of Research: Meaning of Research, its importance, aims and objectives, Identification and criteria of selecting a Research Problem (Hypothesis), literature collection, Research Plan and its components.	
	1.2	Methodology (Experimental design / Field data collection). Data presentation and interpretation. Drawing conclusions.	
	1.3	Hypothesis – Different Types – Significance – Development of Working Hypothesis, Null hypothesis	
	1.4	Research Methods: Scientific method vs Arbitrary Method, Logical Scientific Methods: Deductive, Inductive, Deductive-Inductive, pattern of Deductive – Inductive logical process – Different types of inductive logical methods.	
2.0		**INTRODUCTION OF RESEARCH -II**	**12**
	2.1	Scientific paper writing – Manuscript preparation and presentation. Research Journals, Impact Factor and paper citation index.	
	2.2	Major Research Institutes related to Plant Sciences in India.	
	2.3	A brief idea about Government Research and funding agencies, as DST, DBT, ICAR, ICMR, CSIR, UGC, CST, etc..	
	2.4	IPR and Patenting.	
3.0		**DATA COLLECTION AND ANALYSIS**	**10**
	3.1	Sources of Data – Primary, Secondary and Teritary – Types of Data – Categorical, nominal & ordinal.	
	3.2	Methods of Collecting Data : Observation, field investigations, Direct studies – Reports, Records or Experimental observations.	
	3.3	Methods of Collecting Data: Sampling methods, Data Processing and Analysis strategies, Graphical representation, Descriptive Analysis.	
	3.4	Methods of Collecting Data: Inferential Analysis- Correlation analysis, Least square method, Data Analysis using statistical package, Hypothesis, testing, Generalization and Interpretation and Modeling.	
4.0		**SCIENTIFIC WRITING**	**11**
	4.1	Structure and components of Scientific Reports – types of Report – Technical Reports and Thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports - Illustrations and tables – Bibliography, Referencing and foot notes –	

		Importance of Effective Communication.	
	4.2	Preparing Research papers for journals, Seminars and Conferences – Design of paper using TEMPLATE, Calculations of Impact factor of a journal, citation Index, ISBN & ISSN.	
	4.3	Preparation of Project Proposal - Title, Abstract, Introduction – Rationale, Objectives, Methodology – Time frame and work plan – Budget and Justification – References	
	4.4	Documentation and scientific writing Results and Conclusions, Preparation of manuscript for Publication of Research paper, Presenting a paper in scientific seminar, Thesis writing. Structure and Components of Research Report, Types of Report: research papers, thesis, Research Project Reports, Pictures and Graphs, citation styles, writing a review of paper, Bibliography	
		Total	**45**

SELECTED READINGS:

1. Arora, J.R.. Madhan Mohan, T., Rajendran, G.J., Kannan, S. And Nambiseshan, S. 1993. Research Profile of Biotechnology Activities in India-A Directory. PID, New Delhi.
2. Banerjee, P.B. 2014. Introduction to Biostatistics. S.Chand & Company Pvt. Ltd., New Delhi, India.
3. Bhattacharya, D.K. 2013. Research Methodology, Excel Books, New Delhi. 5
4. Chandel, S.R.S. 1999. A Handbook of Agricultural Statistics. Acha Prakashan Mandir, Kanpur, India
5. Dhopte, A.M. and Livera-M, M. 1989. Useful Techniques for Plant Scientists. Publication of Forum for Plant Physiologist, R.D.G. College, Hostel-1, Akola-444001(M.S.), India.
6. Freeze, J.T. 2000. Sams' Teach yourself: Computer Basics. Macmillan Computer Pub, USA with Techmedia Pub, New Delhi.
7. Gupta, V. 2014. Rapidex Computer Course. Pustak Mahal, Delhi.
8. Harborne J.B. 1998. Phytochemical Methods - A Guide To Modern Technique of Plant Analysis, 3rd edn, Champan & Hall, UK.
9. Heldt, Hans-Walter. 2005. Plant Biochemistry. Academic Press- an Imprint of Elsevier, New Delhi, India.
10. Jain S. K. and R. R. Rao. 1977. Handbook of Field and Herbarium Techniques. Today and Tommorrows Printers and Publishers, New Delhi.
11. Kothari, C.R. and Garg, G. 2014. Research Methodology: Methods and Techniques. New Age International Publishers, New Delhi, India.

12. Kumar, R. 2012. Research Methodology: A Step-By-Step Guide for Beginners. SAGE Pub. India Pvt. Ltd., New Delhi.
13. Panse, V.G. and Sukhatme, P.V.1985. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi, India.
14. Singh, V.P. and Purohit, S. 2003. Research Methodology in Plant Sciences. Scientific Publishers (India), Jodhpur.
15. Snell, N. 1998. Sams' Teach yourself: The Internet Starter Kit. Macmillan Computer Pub, USA with Techmedia Pub, New Delhi.
16. Sundararaj, P. And Siddu, A. 1995. Qualitative Tests and Quantitative Procedures in Biochemistry. Wheeler & Co. Ltd., New delhi, India.

LABORATORY COURSE WORK
Semester-I
(Annual Pattern)
SHMP401: Lab 1 / Based on theory Paper SHMC401

Lab 1 - Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMP401	Lab 1 / Based on theory Paper SHMC401	--	02	--	01	01

Lab 1 - Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMP401	Lab 1 / Based on theory Paper SHMC401	--	--	--	--	05	20	25

Curriculum Details: SHMP401: Lab 1 / Based on theory Paper SHMC401

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Demonstration of various dosage forms available in each system	4
2.	Sample preparations used in Ayurvedic System and their Standardization	4
3.	Sample preparations used in Unani system and their Standardization	4
4.	Sample preparations used in Homeopathy system and their Standardization	4
5.	Sample preparations used in Siddha system and their Standardization	4
6.	Sample preparations used in Tribal and Naturopathy system and their Standardization	4
7.	Visit to Pharmaceutical industries, Ayurvedic, Homeopathic and Unani laboratories and research institutes.	6
	Total	**30**

SHMP402: Lab 2/ Based on theory Paper SHMC402

Lab 2 - Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMP402	Lab 2/ Based on theory Paper SHMC402	--	02	--	01	01

Lab 2 - Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMP402	Lab 2/ Based on theory Paper SHMC402	--	--	--	--	05	20	25

Curriculum Details: SHMP402: Lab 2/ Based on theory Paper SHMC402

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Description and identification of at least two plant species belonging to Meliaceae with their floral formulae and floral diagrams	2
2.	Description and identification of at least two plant species belonging to Malvaceae with their floral formulae and floral diagrams	2
3.	Description and identification of at least two plant species belonging to Verbenaceae with their floral formulae and floral diagrams	2
4.	Description and identification of at least two plant species belonging to Asteraceae with their floral formulae and floral diagrams	2
5.	Description and identification of at least two plant species belonging to Lamiaceae with their floral formulae and floral diagrams	2
6.	Description and identification of at least two plant species belonging to Solanaceae with their floral formulae and floral diagrams	2
7.	Description and identification of at least two plant species belonging to Zingiberaceae with their floral formulae and floral diagrams	2

8.	Description and identification of at least two plant species belonging to Liliaceae with their floral formulae and floral diagrams	2
9.	Study of RAM & SAM with the help of models/ Photographs	2
10.	Study of Vascular tissues using maceration technique	3
11.	Study of Secretary tissues with the help of permanent slides.	3
12.	Study of Structure and types of stomata and trichomes	2
13.	Botanical excursion for onsite study of medicinal plants	4
	Total	**30**

SHMP403: Lab 3/ Based on theory Paper SHMC403

Lab 3- Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMP403	Lab 3/ Based on theory Paper SHMC403	--	02	--	01	01

Lab 3 - Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMP403	Lab 3/ Based on theory Paper SHMC403	--	--	--	--	05	20	25

Curriculum Details: SHMP403: Lab 3/ Based on theory Paper SHMC403

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Effect of time on the rate of reaction of enzyme	2
2.	Estimation of total fats in fatty seeds.	2
3.	Estimation of proteins by Lawerys method	2
4.	Estimation of carbohydrates by Anthrone method	2
5.	Effect of substrate concentration on enzyme kinetics for determination of Km value.	2
6.	Seperation of amino acids by Paper/ TLC chromatography technique	4
7.	Effect of pH and temperature on enzyme kinetics	2
8.	Separation of Alkaloids/Phenols by TLC. (2 practicals)	4
9.	Qualitative Detection of secondary metabolites mentioned in theory	4
10.	Spectrophotometer estimation of secondary metabolites. (2 practicals)	2
11.	Visit to research centre (CCMB, NCL, CFTRI, ICRISAT, and BARC),	2
12.	Field visits/ Laboratory visit of national repute	2
	Total	**30**

SHMEP401: Elective Lab/ Based on Elective Paper SHME401

Elective Lab -Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMEP401	Elective Lab/ Based on Elective Paper SHME401	--	02	--	01	01

Elective Lab-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMEP401	Elective Lab/ Based on Elective Paper SHME401	--	--	--	--	05	20	25

Curriculum Details: SHMEP401: Elective Lab/ Based on Elective Paper SHME401

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Study of different soil types for cultivation of medicinal plants.	2
2.	Effect of temperature and humidity on storage of herbal products.	2
3.	Effect of different fertilizers on the growth of medicinal plants	2
4.	Study of Techniques of growing medicinal plants in nursery.	2
5.	Detection of adulterant in herbal drugs by using chemical method.	2
6.	Detection of adulterant in herbal drugs by using microscopic method.	2
7.	Detection of adulterant in herbal drugs by using analytical techniques.	2

8.	Study of cultivation methods of medicinal plants mentioned in theory	4
9.	Study of cultivation methods of aromatic plants mentioned in theory	4
10.	Visit to medicinal plant nursery	4
11.	Visit to research centre (CCMB, NCL, CFTRI, ICRISAT, and BARC),	2
12.	Visit to Biotechnology/ Tissue culture laboratories, Agriculture Universities, Pharmaceutical industries etc.	2
	Total	**30**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science and Technology

NEP- 2020
SEMESTER PATTERN
Two Year (PG) Program
HERBAL MEICINE- CURRICULUM

With effect from
Academic Year 2023-2024

M. Sc. FIRST YEAR
SEMESTER – II
BOTANY

JUNE, 2023

M. Sc. FIRST YEAR HERBAL MEDICINE CURRICULUM
Semester-II

SHMC451: INSTRUMENTATION MODERN ANALYTICAL TECHNIQUES

Major-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMC451	Instrumentation and Modern analytical techniques	04	--	04	--	04

Major-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMC451	Instrumentation and Modern analytical techniques	20	20	20	80	--	--	100

SHMC451: INSTRUMENTATION MODERN ANALYTICAL TECHNIQUES

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To know working hazards and safety measures in laboratory
2. To know principles and applications of various laboratory equipments.

Course outcomes:

1. Understand the actual working and applications of different laboratory equipments
2. Learn the various techniques used in life sciences and their utility.

Curriculum Details:SHMC451: INSTRUMENTATION MODERN ANALYTICAL TECHNIQUES

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**MICROSCOPY**	
	1.1	Safety in laboratory - Safe use of laboratory equipments, Personal protection, Hazards and waste disposal.	
	1.2	Microscopy – Working and application of simple microscope, compound microscope, Dark field microscope,	**15**
	1.3	Phase contrast microscope, fluorescence microscope, scanning and transmission electron microscope,	
	1.4	Flow cytometry, Micrometry, fixation and staining, Sterilization methods.(Autoclave, Hot air oven and Filtration).	
2.0		**SPECTROSCOPY**	
	2.1	The theoretical aspects, basic instrumentation, elements of interpretation of spectra, and applications of the analytical techniques Colorimetry,	
	2.2	The theoretical aspects, basic instrumentation, elements of interpretation of spectra, and applications of the analytical techniques Ultraviolet and visible spectrophotometry	**15**
	2.3	The theoretical aspects, basic instrumentation, elements of interpretation of spectra, and applications of the analytical techniques - Fluorimetry; Infrared spectrophotometry.	
	2.4	The theoretical aspects, basic instrumentation, elements of interpretation of spectra, and applications of the analytical techniques Flame Photometry; Mass Spectrometry.	
3.0		**CHROMATOGRAPHIC TECHNIQUES**	
	3.1	Classification of chromatographic methods based on mechanism of separation: paper chromatography, thin layer chromatography, column chromatography and affinity chromatography – techniques and applications,	
	3.2	Gas Chromatography: Theory and principle, column operation, instrumentation, derivatisation methods and applications in Pharmacy,	**15**
	3.3	High Performance Liquid Chromatography: Principle, instrumentation, solvents used, elution techniques,	
	3.4	HPTLC: Theory and Principle, instrumentation, elution techniques and pharmaceutical applications.	
4.0		**ELECTROPHORESIS & CENTRIFUGATION TECHNIQUES**	
	4.1	Theory, principles, and instrumentation of paper electrophoresis	**15**
	4.2	Theory, principles, and instrumentation of Gel electrophoresis-	

		SDSPAGE, 2D-PAGE, DIGE, moving boundary electrophoresis	
	4.3	Theory, principles, and instrumentation of Zone Electrophoresis (ZE), Isoelectric focusing (IEF) and applications;	
	4.4	Centrifugation- Theory, principles, instrumentation, applications, types	
		Total	**60**

SELECTED READINGS:

1. Biophysical Chemistry. M. Sataske, Y. Hayashi, M.S. Sethi, S A Iqbal, Discovery Publishing House (1997) New Delhi – 110002.
2. Practical Microbiology. R. C. Dubey, D K Maheshwari S Chand and company Ltd. New Delhi
3. Instrumental Methods of Chemical Analysis 5th Ed. Galen W Ewing. Mc Graw Hill International
4. 4. Biotechniques Theory and Practice S Y S Rana Rastogi Publications, Meerat 250002
5. A manual of laboratory experiments in cell biology C Edward Gasque Universal book Stall, New Delhi.
6. Modern experimental biochemistry 3rd ed. Rodney Boyer Pearson education Inc.
7. Research Experiences in plant physiology.-A Laboratary Mannual Thomas C. Moore Spinger-Verlag,Berlin.
8. Biochemical methods 2nd ed. S. Sadasivam, A. Manickam. New Age International Publisher (P) Ltd, New Delhi.
9. Experiments in Microbiology, Plant Pathology and Tissue Culture K.R. Aneja, Wishwa Prakashan, New Delhi.
10. Frontiers in Applied Microbiology K.G. Mukerji, N C Pathak, Vedpal Sing Print Hall, Lucknow

Practical Microscopy Martin and Johnsen Blackie and Sen Limited, London

SHMC452: MICROBIOLOGY AND PATHOLOGY OF HUMAN DISEASES

Major-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMC452	Microbiology and Pathology of Human Diseases	04	--	04	--	04

Major-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMC452	Microbiology and Pathology of Human Diseases	20	20	20	80	--	--	100

SHMC452: MICROBIOLOGY AND PATHOLOGY OF HUMAN DISEASES

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To know basics of microbiological aspects and immunology
2. To know symptoms of human diseases

Course outcomes:

1. Understand the techniques of culturing and handling microorganism
2. Learn the herbal remedies of human diseases.

Curriculum Details: SHMC452: MICROBIOLOGY AND PATHOLOGY OF HUMAN DISEASES

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**INTRODUCTION OF MICROBIOLOGY**	**15**
	1.1	Introduction to microbiology, Historical developments (Spontaneous generation, Germ theory of disease and Koch's postulates).	
	1.2	General characters of microorganisms; Bacteria, fungi, viruses, Protozoa, Actinomycetes, Rickettsiae, Mycoplasms, Spirochetes.	
	1.3	Bacteria: Size, Shape, Colony Characteristics and Classification of bacteria	
	1.4	Gram positive & Gram negative bacteria. Ultrastucture of bacterial cell.	
2.0		**MICROBIOLOGICAL TECHNIQUES**	**15**
	2.1	Cultivation of microorganisms; pure culture, isolation of pure culture	
	2.2	Media; type of media, composition and preparation of media, maintenance and preservation of culture, sterilization processes.	
	2.3	Type of staining: simple staining, differential staining- gram staining, endospore staining.	
	2.4	Methods of Enumeration of microorganisms- Microscopic method and SPC.	
3.0		**IMMUNOLOGY**	**15**
	3.1	Immunity- Definition and classification. Innate immunity- Species, Racial, Individual, Herd immunity. Acquired immunity- Active and passive immunity, Immune response and hypersensitivity.	
	3.2	Immunoglobulins- basic structure, classes and subclasses of immunoglobulins, antigenic determinants.	
	3.3	Phagocytosis; primary and secondary lymphoid organs; Antigens - immunogens, haptens.	
	3.4	Major Histocompatibility Complex - MHC genes. Precipitation, agglutination and complement mediated immune reactions;	
4.0		**HUMAN DISEASES**	**15**
	4.1	Symptamology, Etiology and herbal remedies of following Human diseases: Typhoids, Cholera,	
	4.2	Symptamology, Etiology and herbal remedies of following Human diseases: Malaria, Common cold	

	4.3	Symptamology, Etiology and herbal remedies of following Human diseases: Diabetes, Jaundice	
	4.4	Symptamology, Etiology and herbal remedies of following Human diseases: Piles, Kidney stone.	
		Total	**60**

SELECTED READINGS:

1. Basic and clinical immunology – Stites et al., 4th edn. Lange 1982.
2. The immunosystem, Mc Connell et al., Blackwell scientific 1981.
3. Fundamentals of Immunology – William C. Boyed (Wiley Toppan).
4. Introduction to Immunology – John W.Kinball.
5. Fundamentals of Immunology – Otto S. View and others.
6. Immunology – D.M. Weir.
7. Immunology – Janis Kuby.
8. Cellular and Molecular Immunology 3rd, Abul K. Abbas Andrew K. Kich man Jordan S. Pober.
9. Microbiology by Pelczar, Chan and Krieg 5th edn. 1995 Mc Grew- Hill.
10. General Microbiology: Boyd, R.F., Times Mirror/ Mosby college, 1984.
11. Review of Medical Microbiology: Jawetz et al., 16th edn. Maruzen Asian, 1984. 4.
12. A Textbook of Microbiology, R.C.Dubey and D.K.Maheswari, S.Chand Co (2001).
13. Pharmaceutical Microbiology, By Hugo and Russell, Blackwell Scientific (1987).
14. Microbial World (5th Edn, 1987) RY. Stanier, Hamshire-Macmillan Press
15. Microbiology 4th edition, Prescott, Harley, Klein (Mc grew Hill)
16. Principles of Microorganisms – Brocks.
17. Fundamentals of Microbiology – M. Frebisher.
18. Text book of Microbiology – William Burrows.
19. Biology of Microorganisms – Sandes T. Lyles
20. Instant notes in Microbiology- Nicklin *et al* (2001)
21. Microbiology – Anantnarayan
22. General Microbiology Vol- I & II, Pawar and Daginawala,

SHMC453: MOLECULAR BIOLOGY AND GENETIC ENGINEERING

Major-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMC453	Molecular Biology and Genetic Engineering	04	--	04	--	04

Major-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)	CA(8)	ESA(9)	
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)				
SHMC453	Molecular Biology and Genetic Engineering	20	20	20	80	--	--	100

SHMC453: MOLECULAR BIOLOGY AND GENETIC ENGINEERING

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To understand basic aspects of cell, cell organelles.
2. To know various basic aspects and techniques used in molecular biology and genetic engineering.

Course outcomes:

1. Understand the structural organization and functions of cell and cell organelles.
2. Able to understand Gene structure, expression and manipulation with the help of various tools of genetic engineering.

Curriculum Details: SHMC453: MOLECULAR BIOLOGY AND GENETIC ENGINEERING

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**CELL AND CELL ORGANELLES**	**15**
	1.1	Prokaryotic and eukaryotic cell structure, Endoplasmic reticulum: Structure, types and functions	
	1.2	Golgi apparatus: Structure, chemical composition and functions, Mitochondrion: Structure, chemical composition, and functions, genomic organization	
	1.3	Chloroplast: Structure, functions and genomic organization, Ribosomes: Structure, types and functions, Nucleus: Structure and Function	
	1.4	Cell cycle: Process and significance of mitosis, Process and significance of meiosis	
2.0		**GENOME ORGANIZATION**	**15**
	2.1	Organization of bacterial genome; Structure of eukaryotic chromosomes; Heterochromatin and Euchromatin	
	2.2	Structure of DNA - A-,B-, Z- DNA; Satellite DNA; DNA methylation	
	2.3	DNA Replication in prokaryotes and eukaryotes	
	2.4	Mutation- mutagenic agents and types. DNA repair Mechanism-Photoreactivation; Nucleotide excision, repair; Mismatch correction; SOS repair.	
3.0		**REGULATION OF GENE EXPRESSION**	**15**
	3.1	Regulation of transcription - Operons, repressors and inducers, positive and negative control, regulation of lytic and lysogenic cycles in phages	
	3.2	Factors in eukaryotes, response elements. Post-transcriptional regulation.	
	3.3	Regulation of gene expression at higher levels of genome organization; Genetic Code.	
	3.4	Mechanism of initiation, elongation and termination; Translation machinery; Regulation of protein synthesis, post-translational regulation. Post-translational modifications	
4.0		**GENETIC ENGINEERING**	**15**
	4.1	Basic techniques (Restriction digestion, production of recombinant DNA molecules, amplification using vectors	
	4.2	Construction of genomic libraries, cDNA libraries and screening DNA libraries for genes of interest);	
	4.3	The manipulation of cloned DNA sequences: in vitro, using	

		phagemid vectors, Restriction and nucleic acid modifying enzymes	
	4.4	Vectors in gene cloning and their choice; plasmids, phages, cosmids, plant viruses, synthetic DNA vectors; Isolation of specific genes from bacteria and higher plants; cloning. Transgenic plants.	
		Total	**60**

SELECTED READINGS:

1. Molecular Biology of Gene- J.D. Watson, T.A. Baker, S.P. Bell, Alexander Gann,
2. Richard Losick, Michael Levine. Pearson Education Singapore, Pvt. Ltd. Delhi
3. Genes – Vol. V, VI & VII Benjamin Lewin Oxfor University Press, New York.
4. Basic Human Genetics Elaine Johansen, Mange & Arthur Mange, Rastogi Publication. Shivaji Raod, Meerut.
5. Principles of Genetics- E.J. Gardner, M.J. Simmons, D.P. Snastad, John Willy and Sons New Delhi. 110 002.
6. Genetics Vol. I & II C.B. Powar, Himalaya Publication, New Delhi.
7. Gentics- B.D. Singh, Kalyani Publishers, Ludhiana – 141 008.
8. Genetics P.K. Gupta Rastogi Publication, Shivaji Raoad, Meerut – 250 002.
9. Genetics Analysis & Principles, Robert J. Brooker, Addison Wesley Longman Inc. New York.
10. Molecular Genetics- Gunther S. Stent, Richard Calendar, CBS Publishers Distributors, New Delhi. – 110 002.
11. Text Book of Molecular Biology K. Sivarama Sastry. Padmanaban, C. Subramanayam, MacMillan India Ltd. Delhi.
12. Cell Biology, Genetics, P.S. Verma S. Chand Publisher
13. Molecular Biology, V.K. Agarwal New Delhi.
14. Genetic Engineering- P. K. Gupta
15. Biotecnology – B. D. Singh

SHME451: FUNDAMENTALS OF PHARMACOGNOSY

Elective-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHME451	Fundamentals of Pharmacognosy	03	--	03	--	03

Elective-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHME451	Fundamentals of Pharmacognosy	15	15	15	60	--	--	75

SHME451: FUNDAMENTALS OF PHARMACOGNOSY

Course pre-requisite:

1. The optional courses are offered to the students registered for post-graduate programs. Such students should have the basic knowledge of Herbal Science and willing to gain additional knowledge in the field of Herbal Medicine. Admissions to this program are given as per the University rules.

Course objectives:

1. To understand basic aspects of pharmacognosy.
2. To know various types of nutraceuticals.

Course outcomes:

1. Understand the detail pharmacognostic study of different drug plants.
2. Able to understand the importance of nutraceuticals in healthcare benefits..

Curriculum Details: SHME451: FUNDAMENTALS OF PHARMACOGNOSY

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**INTRODUCTION**	**15**
	1.1	Definition, history, scope and development of Pharmacognosy, Sources of drugs: Biological, marine, mineral.	
	1.2	Classification of natural drugs: Alphabetical, Morphological, Taxonomical, Chemical, Pharmacological/ Therapeutical and Chemotaxonomical.	
	1.3	Types of Drug adulteration and adulterants.	
	1.4	Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.	
2.0		**NUTRACEUTICALS**	**15**
	2.1	Nutraceuticals: Scope, herbal sources of food supplements, taste enhancers and Colours. Phytochemicals as Neutraceuticals	
	2.2	Occurrence and Characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of Carotenoids – i) α and β – Carotene, ii) Lycopene, iii) Xanthophyll	
	2.3	Occurrence and Characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of Saponins – i) Glycyrrhizin ii) Shatavarins	
	2.4	Occurrence and Characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of Flavonoids – i) Resveratrol ii) Rutin iii) Hesperidin iv) Quercetin. Anthocyanins; Phenolic acids:- Ellagic acid and Tocopherols.	
3.0		**PHARMACOGNOSTIC STUDY OF PLANT DRUGS**	**15**
	3.1	Laxatives- Aloes, Castor oil, Senna. Cardiotonics- Digitalis, Arjuna.	
	3.2	Carminatives - Fennel, Cardamom, Astringents- Catecheu.	
	3.3	Drugs acting on nervous system- Ashwagandha, Opium, Cannabis, Antirheumatics- Guggal, Colchicum.	
	3.4	Antitumour- Vinca. Antidiabetics- Pterocarpus, Gymnema sylvestre. Diuretics- Gokhru, Punarnava.	
4.0		**PHARMACOGNOSTIC STUDY OF BIOMOLECULES**	**15**
	4.1	Carbohydrates and derived products: Agar, Guar gum, Acacia, Honey, Isabgol, Pectin, Starch and Tragacanth.	
	4.2	Lipids: Bees wax, Castor oil, Cocoa butter, Cod-liver oil, Hydnocarpus oil,	
	4.3	Lipids: Kokum, butter, Lard, Linseed oil, Shark liver oil and Wool fat.	

	4.4	Enzymes- Papain.	
		Total	**60**

SELECTED READINGS:

1. Text Book of Pharmacognosy by Kokate C K, Purohit A P, Gokhale S B (Nirali
2. Prakashan, Pune)
3. Trease G.E. and Evans W.C., Pharmacognosy (Balliene Tindall, Eastbourne)
4. Text Book of Pharmacognosy by T.E.Wallis.(CBS Publishers & Distributors,
5. NewDelhi)13

4. Tyler V.E., Brady L.R. and Robbers J.E., Pharmacognosy (Len & Febiger, Philadelphia)

LABORATORY COURSE WORK
Semester-II
(Annual Pattern)

SHMP451: Lab 1 / Based on theory Paper SHMC451

Lab 1-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMP451	Lab 1 / Based on theory Paper SHMC451	--	02	--	01	01

Lab 1-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMP451	Lab 1 / Based on theory Paper SHMC451	--	--	--	--	05	20	25

Curriculum Details: SHMP451: Lab 1 / Based on theory Paper SHMC451

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Study the principle and working of compound microscope.	2
2.	Sterilization of Media/Glassware with the help of autoclave and hot air oven.	2
3.	Calibration of Microscope and measurement of microorganisms.	2
4.	Use of colorimeter for analysis of herbal compounds and their formulations (2 practicals)	2
5.	Use of Spectrophotometer for analysis herbal compounds and their formulations	2
6.	Use of fluorimeter for analysis of herbal compounds	2

7.	Experiments based on Paper chromatography.	2
8.	Experiments based on Gel Electrophoresis	2
9.	Experiments based on TLC Chromatography.	2
10.	Experiments based on HPTLC for herbal	3
11.	Experiments based on IR Spectroscopy	2
12.	Estimation of Na+, K+, Ca++ ions using flame photometer.	3
13.	Visit to Instrumentation laboratory of national repute.	2
14.	Visit to research institutes / Biotechnology/ Tissue culture laboratories / Agriculture Universities.	2
	Total	**30**

SHMP452: Lab 2/ Based on theory Paper SHMC452

Lab 2-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMP452	Lab 2/ Based on theory Paper SHMC452	--	02	--	01	01

Lab 2-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMP452	Lab 2/ Based on theory Paper SHMC452	--	--	--	--	05	20	25

Curriculum Details: SHMP452: Lab 2/ Based on theory Paper SHMC452

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Isolation of bacteria by streak plate technique	2
2.	Identification of microorganisms by simple staining	2
3.	Identification of microorganisms by gram staining	2
4.	Enumeration of microorganisms with serial dilution techniques	3
5.	Growth curve, measure of bacterial population by turbidometry	2
6.	Assay of antibiotics production and demonstration of antibiotic resistance	3
7.	Estimation of Haemoglobin (Hb)	2
8.	Heme agglutination tests for identification of human blood groups	2
9.	Study of symptoms, causative agents and herbal remedies of human diseases Typhoids, Cholera,	2

10.	Study of symptoms, causative agents and herbal remedies of human diseases Malaria, Common cold,	2
11.	Study of symptoms, causative agents and herbal remedies of human diseases Diabetes, Jaundice	2
12.	Study of symptoms, causative agents and herbal remedies of human diseases Piles, Kidney stone	2
13.	Scientific visits to Ayurvedic Medical College	2
14.	Scientific visits to CSIR laboratories, ICMR research station	2
	Total	**30**

SHMP453: Lab 3/ Based on theory Paper SHMC453

Lab 3-Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMP453	Lab 3/ Based on theory Paper SHMC453	--	02	--	01	01

Lab 3-Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMP453	Lab 3/ Based on theory Paper SHMC453	--	--	--	--	05	20	25

Curriculum Details: SHMP453: Lab 3/ Based on theory Paper SHMC453

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Study of different stages of mitosis and determine mitotic index.	2
2.	Study of mitotic abnormalities by using chemical mutagens	2
3.	Study of different stages of meiosis and meiotic irregularities in	2
4.	Isolation of Mitochondria from plant material.	3
5.	Isolation of Chloroplasts from plant material.	3
6.	Study of cellular organelles by ultramicroscopic Photographs	2
7.	Isolation of DNA/RNA from bacteria/Yeast	4
8.	Estimation of DNA/ RNA.	4
9.	Study of DNA repair mechanism by photoreactivation	2
10.	Isolation of plasmids from bacteria.	2
11.	Visit to National Research Institute/ University/ Research Laboratory.	2
	Total	**30**

SHMEP451: Elective Lab/ Based on Elective Paper SHME451

Elective Lab -Teaching Scheme

Course Code	Course Name(Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SHMEP451	Elective Lab/ Based on Elective Paper SHME451	--	02	--	01	01

Elective Lab -Assessment Scheme

Course Code (2)	CourseName (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		TestI (4)	Test II (5)	Avg (T1+T2)/ 2 (6)		CA(8)	ESA(9)	
SHMEP451	Elective Lab/ Based on Elective Paper SHME451	--	--	--	--	05	20	25

Curriculum Details: SHMEP451: Elective Lab/ Based on Elective Paper SHME451

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1.	Determination of drug adulteration using analytical techniques	2
2.	Determination of drug adulteration using microscopic techniques	2
3.	Determination of drug adulteration using chemical techniques	2
4.	Estimation of Lycopene from plant sample	2
5.	Estimation of caretenoids from plant sample	2
6.	Estimation of Rutin and Quercetin from plant sample by using HPTLC	2
7.	Identification of crude drugs belonging to carbohydrates (morphological and chemical) : Agar, Guar gum, Acacia, Honey, Isabgol, Pectin, Starch and Tragacanth.	5

8.	Identification of crude drugs belonging to Lipids (morphological and chemical) : Bees wax, Castor oil, Cocoa butter, Cod-liver oil, Hydnocarpus oil, Kokum, butter, Lard, Linseed oil, Shark liver oil and Wool fat. E**nzymes**- Papain.	5
9.	Pharmacognostic study of plant drugs mentioned in theory.	6
10.	Field visit to identify and study of drug plants.	2
	Total	**30**

Guidelines for Course Assessment:

A. Continuous Assessment (CA) (20% of the Maximum Marks):

This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his **CA** score (col 6).

B. End Semester Assessment (80% of the Maximum Marks):

(For illustration we have considered a paper of 04 credits, 100 marks and need to be modified depending upon credits of an individual paper)

1. **ESA Question paper will consist of 6 questions, each of 20 marks.**
2. **Students are required to solve a total of 4 Questions.**
3. **Question No.1 will be compulsory and shall be based on entire syllabus.**
4. Students need to solve **ANY THREE** of the remaining Five Questions (Q.2 to Q.6) and shall be based on entire syllabus.

Note: **Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.**

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