SPECIALISATION: PHARMACOGNOSY AND PHYTOCHEMISTRY
SEMESTER-II
SCHEME OF TEACHING

SUB CODE	NAME OF SUBJECT	CONTACT HOURS PER WEEK		CREDITS	
		T	P	T	P
521	Advanced Pharmacognosy-I	3	---	4	---
522	Plant Biotechnology	3	---	3	---
523	Chemistry of Medicinal Natural Products-I	3	---	4	---
524	Chemistry of Medicinal Natural Products-II	3	---	4	---
525	Pharmacognosy & Phytochemistry Practical –II	---	18	---	6
526	Seminar / Term Assignment	6	---	---	3
	TOTAL	18	18	15	9

SCHEME OF EXAMINATION

SUB CODE	NAME OF SUBJECT	DURATION OF EXAM (HRS)	MARKS			
			THEORY		PRACTICAL	
			University level evaluation	Institute level evaluation	University level evaluation	Institute level evaluation
521	Advanced Pharmacognosy - I	3	80	20	--	--
522	Plant Biotechnology	3	80	20	--	--
523	Chemistry of Medicinal Natural Products - I	3	80	20	--	--
524	Chemistry of Medicinal Natural Products - II	3	80	20	--	--
525	Pharmacognosy & Phytochemistry Practical – II	12	--	--	80	20
526	Seminar / Term assignment	--	--	--	--	100
	TOTAL		320	80	80	120

SUBJECT **: Advanced Pharmacognosy - I**
SUBJECT CODE **: 521**
RATIONALE **:** This unit discusses recent advances in Pharmacognosy of plants having phytoconstituents. It details the advanced methods to identify and isolate the phytoconstituents from such plants and establish its activity. It also discusses Pharmacovigilance of herbal medicines & Basic principle of Ayurveda, Unani & Siddha and Homeopathy.

COURSE OBJECTIVES **:** At the end of the course student should be able to:

1. Know exhaustive list of plants having active constituents effective against advanced diseases.
2. Know Phytochemistry of these drugs.
3. Discuss phytopharmacology of these drugs.
4. Have knowledge about pharmaceutical adjuvants of plant origin.
5. Understand concept of Ethanopharmacognosy, Ethanomedicine.

LEARNING OUTCOMES: At the end of the course student will be able to:

1. Identify and isolate and characterize the active constituents against advanced diseases from plants.
2. Practice principles of Ayurveda and utilize in herbal medicine.
3. Apply pharmacovigilance in herbal therapy and establish authentic standards.

PREREQUISITES: Organic chemistry.

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
521	Advanced Pharmacognosy-I	3	--	3	4	20	--	80	--	100

521 Advanced Pharmacognosy-I

1	Recent advances in the field of Pharmacognosy with special reference to the review of anticancer (Vinca, Podophyllum, Campotheca, Taxus), antidiabetic (Mamejvo, Gymnema, Jambu, Karela, Kalmegh), anti-inflammatory (Turmeric, Gaultheria, Boswellia, Nagod), antiulcer (Glycyrrhiza, Satavar), adaptogenic (Ashwagandha, Ginseng, Galo), hepatoprotective (Kutki, bhringraj, Phyllanthus, Tephrosia purpurea), antimalarial (Cinchona, Artimesia, Calotropis), diuretics (Gokhru, Punarnava, Apamarg), antianxiety (Valerian, Jatamansi, Rauwolfia, Hyoscyamus), antidepressant (Nutmeg, Kovanch, Crocus sativum), hypolipidemic (Allium sativum, Methi, Guggul), antiasthamatics (Vasaka, Tulsi, Kantakari, Nagarmoth), Antifertility (Gossypium, putranjeev), bioavailability enhancer (Pepper, Tamarind) and memory enhancers (Shankhpuspi, Brahmi, Malkangni) drugs of plant origin.	40
2	Plants as a source of excipient (Guar, xanthangum, plantago ovate, methi, Acacia gum, pectin etc.	10
3.	Pharmacovigilance of herbal medicines: Herb drug interaction and food drug interaction, adverse drug reaction	10
4	Plants polysaccharides as sources of new drugs	10
5	Basic principle of Ayurveda, Unani & Siddha and Homeopathy	20
6	Ethanopharmacognosy, Ethanomedicine, its concepts, scope, and importance	10

SUBJECT : Plant Biotechnology
SUBJECT CODE : 522
RATIONALE : This unit discusses the plant tissue culture techniques in detail with its applications and also plant genomics.

COURSE OBJECTIVES : At the end of the course student should be able to:
1. Understand principles of plant tissue culture and laboratory procedures.
2. Discuss plant genetics for better herbal therapeutics.

LEARNING OUTCOMES: At the end of the course student will be able to:
1. Work in tissue culture area with understanding of all techniques.
2. Practice GLP in tissue culture laboratory.
3. Apply principles of plant genomics for development of therapeutically active herbs.

PREREQUISITES: Plant biology

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
522	Plant Biotechnology	3	--	3	3	20	---	80	--	100

522 Plant Biotechnology

1	Plant Tissue Culture techniques & its application in relation to Phytopharmaceuticals: Introduction, techniques of initiation and maintenance of various types of cultures. Immobilized cell techniques, Biotransformation studies including recent developments in production of biological active constituents in static, suspension and hairy root cultures, Bioreactors for production of biologically active constituents, & Applications of plant tissue culture techniques.	40
2	Genetics in Pharmacognosy: Mendal's laws of hereditary and their application to Pharmacognosy, Chemical races, Selections, Hybridization, Polyploidy, mutation.	20
3	Plant growth hormones, their application and effect on plant growth and its constituents.	15
4	Transgenic plants	10
5	Commercial aspects of biotechnology	05
6	Biodiversity conservation, economic development and drug discovery from traditional medicinal plants of India.	10

SUBJECT : Chemistry of Medicinal Natural Products - I
SUBJECT CODE : 523
RATIONALE : This unit discusses the principles of Phytochemistry, isolation, estimation, structure elucidations, stereochemistry, therapeutic uses and economic importance of key actives. It also discusses General methods of extraction, isolation and purification of plant constituents of following class alkaloids, glycosides, flavonoids, tannins, volatile oils, fixed oils, etc

COURSE OBJECTIVES : At the end of the course student should be able to:
1. Understand classification of phytoconstituents and their chemical screening methods.
2. Identify and isolate similar active from plant.

LEARNING OUTCOMES: At the end of the course student will be able to:
1. Select correct and efficient method of screening of chemical content of plants.
2. Identify Phytopharmaceuticals.
3. Isolate and purify Phytopharmaceuticals.

PREREQUISITES: Basic Pharmacognosy and chemistry.
TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
523	Chemistry of Medicinal Natural Products - I	3	--	3	4	20	--	80	--	100

523 Chemistry of Medicinal Natural Products - I

1	Phytochemical screening: Classification of medicinally active constituents and phyto-chemical study including general chemical tests to identify plant constituents such as alkaloids, glycosides, flavonoids, tannins, volatile oils, fixed oils, steroids, etc.	15
2	General methods of extraction, isolation and purification of plant constituents of following class alkaloids, glycosides, flavonoids, tannins, volatile oils, fixed oils, etc.	20
3	Review of various Phyto-constituents used as prototypes for therapeutically active constituents.	15
4	Study of sources, isolation, estimation, structure elucidations, stereochemistry, therapeutic uses and economic importance of following Phytopharmaceuticals: Alkaloids Atropine, morphine, ephedrine, reserpine, quinine, ergot Glycosides diosgenin, digitoxin, sennoside. Volatile oils (terpenoids) Menthol, thymol, citral. Flavonoids Rutin Coumarin Psoralea Triterpines Glycyrrhizin Lignan Podophyllum **General methods** of estimation, analysis for alkaloids, steroids, terpenoids and flavonoids, tannins	50

SUBJECT **: Chemistry of Medicinal Natural Products - II**
SUBJECT CODE **: 524**
RATIONALE **:** This unit discusses principles of Dereplication for natural products, Stereochemistry and Drug Action, biogenetic pathways of plant chemicals.
COURSE OBJECTIVES **:** At the end of the course student should be able to:

1. Discuss role of stereochemistry in plant constituents.
2. Understand importance of Dereplication process in plant constituent's chemistry.
3. Understand hoe biogenetic pathways affect ADME of plant actives.

LEARNING OUTCOMES: At the end of the course student should be able to:

1. Use principles of chirality to identify and develop more effective plant constituents.

PREREQUISITES: Basic Pharmacognosy and chemistry.
TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
524	Chemistry of Medicinal Natural Products - II	3	--	3	4	20	--	80	--	100

524 Chemistry of Medicinal Natural Products - II

1	**Dereplication for natural products:** Concept of Dereplication, importance of Dereplication, development of Dereplication protocols with examples.	15
2	**Stereochemistry and Drug Action:** Chirality and molecular symmetry, Nomenclature and representations. Role of chirality in selective and specific therapeutic agents. Case studies. Enantioselectivity in drug absorption, metabolism, distribution and elimination.	15
3	Methods of investigation of **biogenetic pathways** and their techniques: Biogenetic pathways for the production of Phytopharmaceuticals, such as Alkyl amine (Ephedra), Pyridine-Piperidine (Lobelia), Tropane (Datura, Belladonna), Quinoline (Cinchona), Isoquinoline (Opium), Indole (Ergot), Cardiac glycosides (Digitalis), Coumarins (Psoralia)and Flavones (Rutin)	40
4	Industrially important **volatile oils**: Natural occurrence, their chemistry, oncogenic variation and trade.	30

SUBJECT : Pharmacognosy & Phytochemistry Practical – II
SUBJECT CODE : 525

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
525	Pharmacognosy & Phytochemistry Practical – II	--	18	18	6	--	20	--	80	100

525 PHARMACOGNOSY & PHYTOCHEMISTRY PRACTICAL – II

	Isolation of
1	Introduction to clavengers, Soxhlet and isolation of volatile oil.
2	Piperine from Piper species
3	Caffeine from Tea leaves,
4	Vasicine isolated by column chromatography from vasaka leaves,
5	Quinine sulfate from Cinchona bark,
6	Nicotine picrate from tobacco leaf,
7	Berberine from Berberis aristata,
8	Diosgenin from fenugreek seeds
9	Strychnine and brucine from nuxvomica seed
10	Resepine from rauwolfia root powder
11	Myristicine from nutmeg.
12	Ca-citrate and pectin from lemon Spp.
13	Podophyllum resin from podophyllum
14	Ammonium glycyrrizinate from glycyrrhiza root.
15	Sennoside from senna pod
	Estimation and Determination of
16	Anthracene derivatives in Senna by spectrophotometric method
17	Reserpine in Rauwolfia by photometric method,
18	Quinine in Cinchona bark by photometric method
19	Carvone content in Dill oil
20	Estimation of total tannins from Triphla churna, amala, baheda, hardae.
21	Estimation of total alkaloids from vasaka leaf
22	Estimation of total phenols
23	**TLC study of different volatile oil samples**

BOOKS RECOMMENDED

1.	Bhat S V, Chemistry Of Natural Products, Narosa Publishing House
2.	O.P. Agrawal, Chemistry Of Natural Products
3.	Chatwal Gurdeep R., Organic Chemistry Of Natural Products, Himalaya Publication
4.	Finar,Organic Chemistry Vol. Ii, Chemistry Of Natural Products, Elbs Publication
5.	Wickery And Wickery, Secondary Plant Metabolites
6.	Medicinal Natural Products, Paul And Devick
7.	Anasari, Pharmacognosy Textbook Of Natural Products, Latest Edition.
8.	Ashutosh Kar, Pharmacognosy And Pharmacobiotechnology,
9.	Rangari & Rangari, Text Book Of Pharmacognosy
10.	Edwin And Edwin, Textbook Of Pharmacognosy And Phytochemistry, CBS Publication
11.	Cultivation And Utilization Of Medicinal Plants By C.K. Atal, R.R. L. Jammu.
12.	Ciddhiverasan, Plant Cell & Tissue Culture - Bio Technology
13.	Mohmad Ali,Techniques in terpenoid identification
14.	Paridhavi, Herbal Drug Technology,
15.	Scheuer,Marine Natural Products, Academic Press, London
16.	Paul And Devick, Medicinal Natural Products
17.	Wickery and Wickery, Secondary Plant metabolites
18.	Kalia, Industial Pharmacognosy
19.	Stall,Thin layer chromatography
20.	Bruneton Jean, Pharmacognosy : Phytochemistry Medicinal Plants, Lavoisier Publishing
21.	Ayurvedic Pharmacopoeia Of India
22.	Herbal Pharmacopeia 1-2 (IDMA)
23.	The Wealth Of India, Raw Materials (All Volumes) Council Of Scientific And Industrial Research (CSIR), New Delhi.
24.	Who Monographs On Selected Medicinal Plants Vol-1-2
25.	Ayurvedic Formulary of India, By Govt of India.
26.	Nadkarni and Satyavati,Indian Medicinal Plants by
27.	Longman, Indian Medicinal Plants
28.	Quality control of Indian Medicinal Plants by ICMR
29.	Purohit,Plant Cell And Tissue Culture by
30.	Narayanaswami S., Plant Cell And Tissue Culture, by
31.	Prakash M,.Cell And Tissue Culture,
32.	Henry Thomas Anderson, The Plant Alkaloids
33.	Harborne J B, Phytochemical Methods, Champan And Hall, International Edition, London
34.	Wagner, Plant Drug Analysis, Springer Verlag Publication.
35.	Remington: The Science & Practice Of Pharmacy, by Gennaro Ar (2000), Lippincott Williams & Wilkins, Philadelphia.
36.	Anees A Siddiqui, Natural Product Chemistry Practical Manual, 2008, CBS Publishing House.

SUBJECT **: Subject Seminar / Term assignment**
SUBJECT CODE **: 526**
RATIONALE : This unit is complementary to compensate the boundryless content of theory syllabus. It includes all aspects of core subject specialization which tangentially touch the content of syllabus. (It does not include routine syllabus topics) All research and reviewed articles along with reference books are taken as basis for preparing a seminar. Innovative topics are ensured in each session.

COURSE OBJECTIVES: At the end of the course the student should be able to:

1. Develop knowledge to refer literature for given topic. Literature search include key words, Library use and internet use.
2. Develop presentation skills.
3. Get peripheral knowledge of the subject with current perspective.

LEARNING OUTCOMES: At the end of the course the student will be able to:

1. Find any reference related to the theme.
2. Have presentation skills in terms of precise and contented, relevant presentation.
3. Identify current perspectives related to the subject.

PREREQUISITES: None

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
526	Subject Seminar/ Term assignment	6	--	6	3	-----	100	-----	-----	100

PHARMACOGNOSY AND PHYTOCHEMISTRY
M.PHARM SEMESTER-III
SCHEME OF TEACHING

SUB CODE	NAME OF SUBJECT	CONTACT HOURS PER WEEK		CREDITS	
		T	P	T	P
531	Advanced Pharmacognosy - II	3	---	3	---
532	Advanced Phytopharmacology	3	---	3	---
533	Advanced Analytical Techniques	3	---	3	---
534	Standardization of Traditional Herbal Drugs	3	---	3	---
535	Pharmacognosy & Phytochemistry Practical – III	---	18	---	6
536	Synopsis (Introduction to Dissertation) & Viva voce	---	---	3	---
537	Subject Seminar	6	---	---	3
	TOTAL	18	18	15	9

SCHEME OF EXAMINATION

SUB CODE	NAME OF SUBJECT	DURATION OF EXAM (HRS)	MARKS			
			THEORY		PRACTICAL	
			University level evaluation	Institute level evaluation	University level evaluation	Institute level evaluation
531	Advanced Pharmacognosy - II	3	80	20	---	---
532	Advanced Phytopharmacology	3	80	20	---	---
533	Advanced Analytical Techniques	3	80	20	---	---
534	Standardization of Traditional Herbal Drugs	3	80	20	---	---
535	Pharmacognosy & Phytochemistry Practical – III	12	---	---	80	20
536	Synopsis (Introduction to Dissertation) & Viva voce	---	80	20	---	---
537	Subject Seminar	---	---	---	---	100
	TOTAL		400	100	80	120

SUBJECT : Advanced Pharmacognosy - II
SUBJECT CODE : 531
RATIONALE : This unit discusses development of Phytopharmaceuticals. Principles of development process involving marine natural actives, Actives of microbial origin, Toxins and venoms of plant origin, etc.

COURSE OBJECTIVES : At the end of the course student should be able to:
1. Discuss natural products of marine, microbial and plant origin.
2. Describe drug product development of natural products.
3. Know the role of immunological from plant origin.

LEARNING OUTCOMES: At the end of the course student should be able to:
1. Develop effective drug delivery system of natural products.
2. Prepare necessary documents for natural product development.
3. Know procedures for clinical trials of herbal products.

PREREQUISITES: basic Pharmacognosy.

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
531	Advanced Pharmacognosy - II	3	--	3	3	20	--	80	--	100

531 Advanced Pharmacognosy - II

1	Approach available for drug development, role of natural products in new drug development	20
2	Importance of marine natural products chemistry in drug development. Chemistry and biology of marine natural products	15
3	Recent developments in natural product chemistry of microbial sources.	15
4	Drug discovery in area of toxin and venoms	10
5	Plant bodies (immunoglobins) from plants.	10
6	Clinical Trial of Herbal Drugs	10
7	Preparation of DMF for herbal medicines.	10
8	Insecticides and pesticides from natural sources	10

SUBJECT : Advanced Phytopharmacology
SUBJECT CODE : 532
RATIONALE : This unit discusses biological evaluation of phytoconstituents. It also includes details of biopharmaceutical and toxicological studies of drugs derived from plants.

COURSE OBJECTIVES: At the end of the course student should be able to:

1. Understand general principles of biological screening of plant derived chemicals.
2. Know different methodology to establish bioactivity of phyto constituents.
3. In vitro in vivo screening methods of bioactive.

LEARNING OUTCOMES: At the end of the course student should be able to:

1. Discriminate different methods of estimation of biological activity of plant derived constituents.

PREREQUISITES: Chemistry and analysis.

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
532	Advanced Phytopharmacology	3	--	3	3	20	--	80	--	100

532 Advanced Phytopharmacology

1	General principles of screening, correlations between various animal models and human situations and animal ethics (CPCSEA)	10
2	**Bioactivity:** Activity versus toxicity, rapid screening methods, correlation between enzyme inhibition and pharmacological activity, general screening of enzyme, inhibitors, radio ligand receptor binding assays (adrenoreceptors, opiate, benzodiazepine, ion channels, 5 HT, dopamine, adenosine, muscarinic, histamine, ATPase, GABA), cytotoxicity tests	20
3	In vitro and in vivo screening models for evaluation of drugs having anti-cancer, antidiabetic, antifertility, anti-inflammatory, anti-arthritic, anti-asthmatic, anti-hyperlipidemic, anti-pyretic, hepatoprotective, nephroprotective, immuno-modulatory, adaptogenic, diuretic, lithotriptic, antimicrobial, antiviral, anti-acne, antimalarial, anti-oxidant, antiparasitic, wound-healing, anti-mutagenic, antiulcer, memory-enhancer, anti-depressant, anti-psychotic and epileptic activities.	40
4	Bioavailability and pharmacokinetic aspect for herbal drugs with examples of well-known documented, clinically used herbal drugs And Phytoequivalence and pharmaceutical equivalence. Techniques for enhancement of bioavailability of herbal drugs.	20
5	Toxicity studies and dose calculation	10

SUBJECT **: Advanced Analytical Techniques**
SUBJECT CODE **: 533**
RATIONALE **:** This unit discusses analytical techniques, its' principles of working, instrumentation and result interpretation of plant derives drugs.

COURSE OBJECTIVES : At the end of the course student should be able to:

1. Know the principles of different analytical methods for herbal drugs.
2. Know the methods of UV, IR, NMR and Mass spectroscopy for structural elucidation of selected natural products.

LEARNING OUTCOMES: At the end of the course student should be able to:

1. Apply and select correct method of estimation of herbal drugs.

PREREQUISITES: Pharmaceutical Analysis.

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
533	Advanced Analytical Techniques	3	--	3	3	20	--	80	--	100

533 Advanced Analytical Techniques

1	Applications of Spectroscopic techniques: UV, IR, NMR and Mass spectroscopy for structural elucidation of selected natural products.	40
2	Application of chromatographic techniques: Column chromatography, paper chromatography, TLC, HPTLC, GLC, HPLC, UPLC, and flash chromatography in the isolation, purification and analysis of Phytopharmaceuticals.	50
3	Applications of Spectroflurimetry in herbal drug analysis	10

SUBJECT **: Standardization of Traditional Herbal Drugs**
SUBJECT CODE **: 534**
RATIONALE **:** This unit discusses a comparative study of Ayurvedic and modern dosage form, Standardization of herbal drug, Importance of monographs of standards of medicinal plants their parts, Stability testing of natural products, Strategy for identification of adulteration and QC of herbal drugs.

COURSE OBJECTIVES **:** At the end of the course student should be able to:

1. Discuss Ayurvedic products with classification and standardization.
2. Understand strategies for QC methods and result analysis of herbal drugs.
3. Know regulatory aspects of QC and QA aspects of herbal drugs.

LEARNING OUTCOMES: At the end of the course student should be able to:

1. Select and implement QC methods for batch to batch control of herbal products.
2. Prepare stability testing protocols and QC protocols for herbal product standardization**.**

PREREQUISITES: Basic Pharmacognosy, Phytochemistry, Drug laws for herbals.

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
534	Standardization of Traditional Herbal Drugs	3	--	3	3	20	---	80	--	100

534 Standardization of Traditional Herbal Drugs

1	**A comparative study of Ayurvedic and modern dosage form:** classification, different stages of Ayurvedic formulations and dosage forms; Modernization of some Ayurvedic formulations.	20
2	Standardization of herbal drug: Formulation of single /compound drug and their quality, safety and efficacy assessment and intended use for acceptance by regulatory authorities. Factors affecting quality, documentation and preservation of herbs and herbal products.	20
3	Importance of monographs of standards of medicinal plants their parts, comparative study as per different pharmacopoeias. WHO guideline for manufacturing and standardization of herbal drugs and their formulations. Current good manufacturing practices for herbal medicines (schedule T).	20
4	Concept of natural product marker compounds/ extract library as a tool as a solution towards present problems of standardization of natural products.	10
5	Stability testing of natural products, procedures, predictable chemical and galenical changes, technical limitations, testing methods and combination products.	10
6	Quality control of various types of official formulations including Ayurvedic preparations	10
7	Strategy for identification of adulteration of synthetic drug in herbal formulation	10

SUBJECT : Pharmacognosy & Phytochemistry Practical –III
SUBJECT CODE : 535

TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
535	Pharmacognosy & Phytochemistry Practical –III	--	18	18	6	--	20	--	80	100

535 Pharmacognosy & Phytochemistry Practical –III

1	Determination of cardiac glycosides in digitalis leaves.
2	Determination of Ascorbic acid (vitamin C) in Lemon and Orange.
3	UV Determination of Caffeine Content in Selected Soft Drinks
4	Estimation of resin-content in sample of Podophyllum(B.P.C.Method)
5	Isolation of androgroholide from Kalmegh
6	Isolation of lutein from marigold flower petals Extraction
7	Introduction of Paper chromatography.
Standardization of Formulation	
8	To characterization & analysis of VICCO Turmeric cream
9	Evaluation of Herbal Shampoo
10	Evaluation of Hair oil
11	Evaluation of Syrup
12	Standardization of Trikatu Churna. (Market/Laboratory formulation)
13	Standardization of Triphla Churna. (Market/Laboratory formulation)
Physicochemical analysis	
14	Determination of foaming index of given drug samples.
15	Determination of moisture (Loss on Drying) of given drug samples.
16	Determination of swelling index of given drug sample.
17	Determination of Ash Value of given Drug samples.
18	Determination of Extractive Value of given Drug samples.
19	Determination of Bitterness Value of given Drug samples.
20	Determination of hemolytic index of given Drug samples.
21	Determination of foreign organic matter/purity by Wallis's Lycopodium Spore Method.
22	Phytochemical analysis of sample drug.
23	Demonstrations of Experimental animal models
24	Introduction, handling and Application of HPTLC
	Effect of Edge cutting, chamber saturation, Multiple run in the same mobile phase on chromatographic separation.
	Effect of stored mobile phase, prewashing, and impregnation with EDTA on chromatographic separation.

	Effect of amount of sample, application speed and distance between tracks on chromatographic separation.
25	Simultaneous estimation of given marker in market preparation by HPTLC.

BOOKS RECOMMENDED

1.	Phytochemical Methods : A Guide To Modern Techniques Of Plant Analysis, Harborne J.B.
2.	Quality Control Methods For Medicinal Plant Materials, Who
3.	Pulok Mukherjee, Quality Control Of Herbal Drugs : An Approach To Evaluation Of Botanicals
4.	Chemistry And Pharmacology Of Vasicine - A New Oxytocic And Abortifacient, Atal C.K.
5.	Bhat S V, Chemistry Of Natural Products, Narosa Publishing House
6.	O.P. Agrawal, Chemistry Of Natural Products
7.	Chatwal Gurdeep R., Organic Chemistry Of Natural Products, Himalaya Publication
8.	Finar,Organic Chemistry Vol. Ii, Chemistry Of Natural Products, Elbs Publication
9.	Wickery And Wickery, Secondary Plant Metabolites
10.	Medicinal Natural Products, Paul And Devick
11.	Anasari, Pharmacognosy Textbook Of Natural Products, Latest Edition.
12.	Ashutosh Kar, Pharmacognosy And Pharmacobiotechnology,
13.	Rangari & Rangari, Text Book Of Pharmacognosy
14.	Edwin And Edwin, Textbook Of Pharmacognosy And Phytochemistry, CBS Publication
15.	C.K. Atal, Cultivation And Utilization Of Medicinal Plants
16.	Ciddhiverasan, Plant Cell & Tissue Culture - Bio Technology
17.	Mohmad Ali,Techniques in terpenoid identification
18.	Paridhavi, Herbal Drug Technology,
19.	Paul And Devick, Medicinal Natural Products
20.	Wickery and Wickery, Secondary Plant metabolites
21.	Kalia, Industial Pharmacognosy
22.	Ghosh, Essential of Pharmacology
23.	Harborne J B, Phytochemical Methods, Champan And Hall, International Edition, London
24.	Wagner, Plant Drug Analysis, Springer Verlag Publication.
25.	Vogel, Pharmacological model
26.	Stall,Thin layer chromatography
27.	Bruneton Jean, Pharmacognosy : Phytochemistry Medicinal Plants, Lavoisier Publishing
28.	Ayurvedic Pharmacopoeia Of India
29.	Herbal Pharmacopeia 1-2 (IDMA)
30.	The Wealth Of India, Raw Materials (All Volumes) Council Of Scientific And Industrial Research (Csir), New Delhi.
31.	Who Monographs On Selected Medicinal Plants Vol-1-2
32.	Ayurvedic Formulary of India, By Govt of India.
33.	Nadkarni and Satyavati,Indian Medicinal Plants by
34.	Longman, Indian Medicinal Plants
35.	Quality control of Indian Medicinal Plants by ICMR
36.	Henry Thomas Anderson, The Plant Alkaloids
37.	Remington: The Science & Practice Of Pharmacy, by Gennaro Ar (2000), Lippincott Williams & Wilkins, Philadelphia.
38.	Fitoterapia- (1980 Onwards).
39.	Planta Medical (1980 Onwards).
40.	Plant Cell, Tissue And Organ Culture (1980 Onwards).
41.	Journal Of Ethno pharmacology (1980 Onwards).

42.	Journal Of Natural Products (1970 Onwards).
43.	Phytochemistry (1970 Onwards).
44.	Pharmaceutical Biology
45.	Indian drugs
46.	Journal of Natural remedies
47.	MAPA (Medicinal & Aromatic Plant Abstracts) (1980 onwards)- (Most Important)
48.	Journal of scientific and Industrial Research
49.	Indian Journal of Industrial Research
50.	Journal of experimental Biology.
51.	Ganga Sahay Pandye and Krushnachandra Chunekar, Bhavprakash Nighantu
52.	G D Singhal Susruta-Samhita : Ancient Indian Surgery Vol-1,2nd ed.
53.	G D Singhal Susruta-Samhita : Ancient Indian Surgery Vol-2,2nd ed.
54.	G D Singhal Susruta-Samhita : Ancient Indian Surgery Vol-3,2nd ed.
55.	Bapalal G Vaidya Nighantu Adarsa Vol-1
56.	Bapalal G Vaidya Nighantu Adarsa Vol-2

SUBJECT **: Subject Seminar**
SUBJECT CODE **: 537**
RATIONALE : This unit is complementary to compensate the boundryless content of theory syllabus. It includes all aspects of core subject specialization which tangentially touch the content of syllabus. (It does not include routine syllabus topics) All research and reviewed articles along with reference books are taken as basis for preparing a seminar. Innovative topics are ensured in each session.

COURSE OBJECTIVES : At the end of the course the student should be able to:

1. Develop knowledge to refer literature for given topic. Literature search include key words, Library use and internet use.
2. Develop presentation skills.
3. Get peripheral knowledge of the subject with current perspective.

LEARNING OUTCOMES: At the end of the course the student will be able to:

1. Find any reference related to the theme.
2. Have presentation skills in terms of precise and contented, relevant presentation.
3. Identify current perspectives related to the subject.

PREREQUISITES: None
TEACHING AND EVALUATION SCHEME:

SUB CODE	TITLE OF SUBJECT	TEACHING SCHEME			CREDITS	EVALUATION SCHEME				TOTAL MARKS
						INTERNAL		EXTERNAL		
		T	P	TOTAL HRS		Theory	Practical	Theory	Practical	
537	Subject Seminar	6	--	6	03	-----	100	-----	-----	100

SPECIALISATION: PHARMACOGNOSY AND PHYTOCHEMISTRY
SEMESTER-IV

SCHEME OF TEACHING

SUB CODE	NAME OF SUBJECT	CONTACT HOURS PER WEEK	CREDITS
541	Dissertation (Project Work)	36	12
542	Viva- Voce	----	12

SCHEME OF EXAMINATION

SUB CODE	NAME OF SUBJECT	UNIVERSITY LEVEL EVALUATION
541	Dissertation	100
542	Viva- Voce	100
	TOTAL	200