



Chhattisgarh Swami Vivekanand Technical University (CSVTVU), Bhilai (CG)

Scheme of Teaching and Examination

Courses of Study and Scheme of Examination of Master of Pharmacy (Phytomedicine)

Semester – I

S. No.	Board of Study	Subject	Subject Code	Period per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
				L	T	P	Theory/Practical				
				ESE	CT	TA					
1	Pharmacy	Advanced Research Methods	565111(41)	4	1	-	100	20	20	140	-
2	Pharmacy	Pharmacology and Biostatistics	565112(41)	4	1	-	100	20	20	140	-
3	Pharmacy	Drug Regulatory Affairs and Quality Assurance	565113(41)	4	1	-	100	20	20	140	-
4	Pharmacy	Formulation Development	565114(41)	4	1	-	100	20	20	140	-
5	Pharmacy	Advanced Research Methods (Lab)	565121(41)	-	-	6	100	-	40	140	-
6	Pharmacy	Pharmacology and Biostatistics (Lab)	565122(41)	-	-	6	100	-	50	150	-
7	Pharmacy	Formulation Development (Lab)	565123(41)	-	-	6	100	-	50	150	-
Total				16	04	18	700	80	220	1000	-

L- Lecture, T- Tutorial, P- Practical,

Duration of Theory paper: 3 hours

ESE – End Semester Examination, CT – Class Test, TA- Teacher Assessment

Note: The Syllabi, Scheme of teaching and exams for first semester M.Pharmacy course shall remain common for all specializations.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Pharmacy 1st Semester**

Subject: **Advance Research Methods**

Total Theory Periods: **50**

Total Marks in the End Semester: **100**

Minimum of Class Test to be Conducted: **2**

Branch: **Pharmacy**

Code: **565111(41)**

Total Tutorial Periods: **12**

Unit - 1 :

Spectroscopic Method – Introduction, application structure elucidation using UV, IR, NMR, Mass spectrometry with examples.

Unit – 2 :

Separation Techniques – Theory, Instrumentation and application of GLC, HPLC, HPTLC, Chiral chromatography, Ion Pair Chromatography.

Unit – 3 :

Thermal Analysis – Theory, Instrumentation and application of thermo-gravimetric analysis, differential thermal thermal analysis.

Unit – 4 :

Calorimetric analysis – theory, instrumentation, chemical application and structural elucidation, differential scanning calorimetric (DSC), Isothermal titration.

Unit – 5 :

Immunochemical techniques – Immunelectrophoresis, immunoprecipitation, ELISA, radioimmunoassay.

Books Recommended:

1. Practical Pharmaceutical Chemistry, Backett, and Stenlake.
2. Spectrophotometric identification of organic compound, Silverstein.
3. Vogel's Text book of Quality analysis, 5th and 6th edition, Svehla.
4. Textbook of Pharmaceutical chemistry, L. G. Chatten.
5. Instrumental Method of Chemical Analysis.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Pharmacy 1st Semester**
Subject: **Pharmacology and Biostatistics**
Total Theory Periods: **50**
Total Marks in the End Semester: **100**
Minimum of Class Test to be Conducted: **2**

Branch: **Pharmacy**
Code: **565112(41)**
Total Tutorial Periods: **12**

Unit – 1 :

Drug dependence, tolerance, abuse drug allergy and resistance.

Unit – 2 :

Genetics, gene cloning, gene delivery and recombinant DNA.

Unit – 3:

Molecular pharmacology, receptor theories, receptor isolation radio- ligand binding studies, Signal transduction mechanism of the cell.

Unit – 4 :

Therapeutics regimens – therapeutics response and toxicity, dosage regimens, clinical trial studies, ADME – Pharmacokinetics, Drug – drug interaction and bioassay.

Unit – 5:

Biological screening of new compounds and New drug discovery.

Unit – 6 :

Bio-statistics – Student “t” test, chi-square test, correlation probit analysis, analysis of variances.

Books Recommended:

1. The Pharmacological basis of therapeutics-Goodman and Gill man's
2. Pharmacology- Rang & Dale.
3. Pharmacology-Katzung.
4. Fundamentals of experimental Pharmacology-By M.N.Ghosh
5. Hand book of Experimental Pharmacology-S.K.Kulakarni
6. Text book of in vitro practical Pharmacology by Ian Kitchen
7. Pharmacological Experiments on intact preparations by Churchill Living stone.
8. Hand book of Clinical Pharmacokinetics Gibaldi and Prescott.
9. Indian Pharmacopoeia and other Pharmacopeias.
10. Screening methods in Pharmacology by Robert Turner.A
11. Clinical trials and tribulations by Allien E.Cato
12. Drug discovery and Evaluation by Vogel H.G.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Pharmacy 1st Semester**

Branch: **Pharmacy**

Subject: **Drug Regulatory Affairs and Quality Assurance**

Code: **565113(41)**

Total Theory Periods: **50**

Total Tutorial Periods: **12**

Total Marks in the End Semester: **100**

Minimum of Class Test to be Conducted: **2**

Unit – 1 :

Requirement of GMP, CGMP, GLP, USFDA, WHO guidelines and ISO 9000 series.
Drug and cosmetics acts and rules. Drug regulatory affairs.

Unit – 2 :

Documentation – Protocols, forms and maintenance of record in Pharmaceuticals industry.

Unit – 3 :

Preparation of documentation of new drug approval and export registration, processing and its application intellectual property rights (patent, copyright and trade marks) Sewage disposal and pollution control.

Unit – 4 :

Concept in validation of manufacturing, analytical and process, validation and its application.

Unit – 5 :

Basic concept of quality control and quality assurance system, source and control of quality variation of raw material, containers, closures personnel, environmental etc.

Unit – 6 :

In process quality control test, IPQC problem in pharmaceutical industries, ICH guidelines.

Unit – 7 :

Sampling plans, Sampling and characteristics curves, Master formula generation and maintenance, standard operating procedure (SOP) for different dosage forms.

Book Recommended:

1. Theory and Practice of Industrial Pharmacy By Lachmann and Libermann
2. Pharmaceutical dosage forms: Tablets Vol. 1-3 by Leon Lachmann.
3. Pharmaceutical Dosage forms: Disperse systems, Vol, 1-2; By Leon Lachmann.
4. Pharmaceutical Dosage forms: Parenteral medications Vol. 1-2; By Leon Lachmann.
5. Modern Pharmaceutics; By Gillbert and S. Banker.
6. Remington's Pharmaceutical Sciences.
7. Advances in Pharmaceutical Sciences Vol. 1-5; By H.S. Bean & A.H. Beckett.
8. Physical Pharmacy; By Alfred martin
9. Bentley's Textbook of Pharmaceutics – Rawbins.
10. Good manufacturing practices for Pharmaceuticals: A plan for total quality control, Second edition; By Sidney H. Willig.
11. Quality Assurance Guide; By Organization of Pharmaceutical producers of India.
12. Drug formulation manual; By D.P.S. Kohli and D.H.Shah. Eastern publishers, New Delhi.
13. How to practice GMPs; By P.P.Sharma. Vandhana Publications, Agra.
14. Pharmaceutical Process Validation; By Fra. R. Berry and Robert A. Nash.
15. Pharmaceutical Preformulations; By J.J. Wells.
16. Applied production and operations management; By Evans, Anderson, Sweeney and Williams.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Pharmacy 1st Semester**
Subject: **Formulation Development**
Total Theory Periods: **50**
Total Marks in the End Semester: **100**
Minimum of Class Test to be Conducted: **2**

Branch: **Pharmacy**
Code: **565114(41)**
Total Tutorial Periods: **12**

Unit – 1:

Stability, solubility, Pka, Dissolution rate, Partition Coefficient. In Vitro and In Vivo evaluation techniques, product formulation and CGMP.

Unit –2:

Designing of Pharmaceuticals - Tablets formulation, special tablets and preparation of components for compression. Characterization of granulation, Coating of tablets, evaluation of tablets. Equipment and processing problem in tablets.

Unit – 3:

Topical and rectal absorption of drug, formulations and evaluations.

Unit – 4:

Formulation consideration of oral liquids, suspension, emulsion, development of various products.

Unit – 5:

Formulation consideration of parenteral ophthalmic, depot products, large volume and small volume parenteral, environmental control and quality assurance in parenteral drug manufacturing.

Unit – 6:

Stability in pharmaceuticals and study of stability kinetics.

Unit – 7:

Introduction to controlled and novel drug delivery system, Sustained release dosage form, prodrug concept, Nanoparticals, Liposomes, Resealed erythrocytes, Transdermal and other Novel drug delivery systems.

Unit – 8:

Types of container and closures, packaging and stability assessment.
Optimization techniques in pharmaceutical formulations and processing.
Pilot plant and scale up techniques.

Book Recommended :

1. Controlled Drug Delivery System, J.R. Robinson and V.H.S.L. Lee.
2. Physical Pharmacy, 4th edition, A. Martin, J.C. Swarbrick.
3. Pharmaceutical analysis, 'Ramington' A. R. Gennaro.
4. The theory and practice of Industrial pharmacy, IIIrd edition, L. Lachman, H. A. Liberman.
5. Modern Pharmaceutics, IInd edition, G. S. Banker, C.T. Rhodes.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Pharmacy 1st Semester**

Branch: **Pharmacy**

Subject: **Advance Research Methods (Lab)**

Code: **565121(41)**

Total Practical Periods: **72**

Total Marks in the End Semester: **100**

List of Experiment:

1. Determination of α_{\max} and Linearity of methylene blue by spectroscopic method.
2. To determine the absorption curve of aromatic hydrocarbons and the analysis of binary mixture.
3. Estimation of Aspirin by colorimetry.
4. Assay of Paracetamol tablet by UV spectroscopy.
5. Determination of the active constituents in a medicinal preparation by derivative spectroscopy.
6. Estimation of Paracetamol by HPLC.
7. Identification of given sample by paper chromatography.
8. Identification of drug's by TLC.
9. To determine the purity of commercial benzoic acid using compressed discs (IR).
10. Interpretation of given sample by IR spectra.

Books Recommended:

1. Practical Pharmaceutical Chemistry, Backett, and Stenlake.
2. Spectrophotometric identification of organic compound, Silverstein.
3. Vogel's Text book of Quality analysis, 5th and 6th edition, Svehla.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Pharmacy 1st Semester**
Subject: **Pharmacology and Biostatistics (Lab)**

Branch: **Pharmacy**
Code: **565122(41)**

Total Practical Periods: **72**

Total Marks in the End Semester: **100**

List of Practicals:

1. To Study the maintenance of common laboratory animals.
2. Bioassay of the more important biogenic agents by various methods.
3. Pharmacological Screening methods used for CNS, Local anesthetics, Endocrine and In-vitro microbial screening.
4. Protocol design of Clinical Trials.
5. Biostatistical study of given data.

Books Recommended:

1. The Pharmacological basis of therapeutics-Goodman and Gill man's
2. Pharmacology- Rang & Dale.
3. Pharmacology-Katzung.
4. Fundamentals of experimental Pharmacology-By M.N.Ghosh
5. Hand book of Experimental Pharmacology-S.K.Kulakarni
6. Text book of in vitro practical Pharmacology by Ian Kitchen
7. Pharmacological Experiments on intact preparations by Churchill Living stone.
8. Hand book of Clinical Pharmacokinetics Gibaldi and Prescott.
9. Indian Pharmacopoeia and other Pharmacopeias.
10. Screening methods in Pharmacology by Robert Turner.A
11. Clinical trials and tribulations by Allien E.Cato
12. Drug discovery and Evaluation by Vogel H.G.

JOURNALS

1. Indian Journal of Pharmacology.
2. Indian Journal of Physiology and Pharmacology.
3. Indian Journal of Experimental Biology.
4. Pharmacological research.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: **M. Pharmacy 1st Semester**
Subject: **Formulation Development (Lab)**
Total Practical Periods: **72**
Total Marks in the End Semester: **100**

Branch: **Pharmacy**
Code: **565123(41)**

1. To prepare and evaluate aspirin tablets by wet granulation method.
2. To evaluate and compare at least three marketed Paracetamol tablets.
3. To study the effect of various binders on the hardness and dissolution rate of ascorbic acid tablets, at different concentration.
4. To prepare 10gm of sustained release granules of ascorbic acid by Microencapsulation method.
5. To perform the pre-formulation studies of the given sample of ascorbic acid.
6. To study the dissolution profile of marketed sustained release products of aspirin.
7. To prepare and evaluate partially flocculated suspension of Paracetamol by using electrolyte.
8. To prepare and evaluate suspension of aspirin.
9. To study the effect of various suspending agents on sedimentation rate at different concentration.

Book Recommended :

1. Controlled Drug Delivery System, J.R. Robinson and V.H.S.L. Lee.
2. Physical Pharmacy, 4th edition, A. Martin, J.C. Swarbrick.
3. Pharmaceutical analysis, 'Ramington' A. R. Gennaro.
4. The theory and practice of Industrial pharmacy, IIIrd edition, L. Lachman, H. A. Liberman.
5. Modern Pharmaceutics, IInd edition, G. S. Banker, C.T. Rhodes.



Chhattisgarh Swami Vivekanand Technical University (CSV TU), Bhilai (CG)

Scheme of Teaching and Examination

Courses of Study and Scheme of Examination of Master of Pharmacy (Phytomedicine)

Semester – II

S. No.	Board of Study	Subject	Subject Code	Period per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
							Theory/Practical				
				L	T	P	ESE	CT	TA		
1	Pharmacy	Herbal Drug Development	5108211(041)	4	1	-	100	20	20	140	-
2	Pharmacy	Phytotherapy and Clinical Application of Medicinal Plants	5108212(041)	4	1	-	100	20	20	140	-
3	Pharmacy	Advances in Phytomedicine	5108213(041)	4	1	-	100	20	20	140	-
4	Pharmacy	Natural Medicines of Traditional Origin & IPR	5108214(041)	4	1	-	100	20	20	140	-
5	Pharmacy	Herbal Drug Development (Lab)	5108221(041)	-	-	6	100	-	50	150	-
6	Pharmacy	Phytotherapy and Clinical Application of Medicinal Plants (Lab)	5108222(041)	-	-	6	100	-	50	150	-
7	Pharmacy	Advances in Phytomedicine (Lab)	5108223(041)	-	-	6	100	-	40	140	-
Total				16	04	18	700	80	220	1000	-

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.Pharm 2nd

Subject: Herbal Drug Development

Total Theory period: 50

Total marks in the end Semester: 100

Minimum of class test to be conducted: 02

Branch: Pharmacy

Subject Code: 5108211(041)

Total Tutorial period: 12

Unit I:

Herbal Drug Industry

- Infrastructure of herbal drug industry involved in production of standardized extracts.
- Current challenges in upgrading and modernization of herbal formulations
- Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction
- Pilot plant scale –up techniques, case studies of herbal extracts. Formulation and production management of herbals

Industrial Fermentation Products

- Biofuels:-Ethanol, Hydrogen
- Antibiotics:- β -lactum antibiotics (Synthetic penicillin), Streptomycin, Cephalosporin.
- Biopreservative: Lactobacillus sakei. Biopolymers:-Xanthan, Polyhydroxyalkanoates.
- Thermostable enzymes:-Proteases. Biosurfactants: a comparative account.

Unit II:

Regulatory Requirements for Setting Herbal Drug Industry and GMP for the Production of Quality Botanicals

- Entrepreneur: Concept, characteristics of entrepreneur, types and functions of entrepreneur,
- Institutional Finance to Entrepreneurs- Commercial banks, other financial institutions-
- Export Import policy
- Concepts of TQM, GMP, GLP, ISO-9000
- Good practices in collection of plant materials.

Unit III:

General Methods of Processing of Herbs and Methods of Preparation of Extracts

- Methods for identification and authentication of herbs.
- Different methods of processing of herbs like collection, harvesting, garbling, packing and storage conditions.
- Methods of drying.
- Principles of extraction and selection of suitable extraction method.
- Advanced extraction methods using Green Technologies.

Unit IV:

Standardization of Herbal Raw materials and Extracts and Isolation and Estimation of Phytoconstituents

- Standardization of herbal raw materials including Pharmacognostical, physical, chemical and biological methods with examples.

- Qualitative and Quantitative estimation of active principles from standardized extracts by HPLC/HPTLC/Spectroscopic analysis.
- Different methods (including industrial) for isolation and estimation of phytoconstituents from the following drugs (with special emphasis on HPLC and HPTLC).
 1. Andrographolides from *Andrographis paniculata*.
 2. Alicin from Garlic.
 3. Piperine from *Piper nigrum* / *Piper longum*.

Unit V:

Natural Excipients

- a) Definition and Classification of natural excipients.
- b) Source, description and standard parameters, uses and storage condition of the following:
 - Binding agents, Granulating agents, Disintegrating agents, Diluents, Glidants, Emulsifying, Suspending and Thickening agents
 - i) Acaica ii) Tragacanth iii) Starch v) Guar gum vi) CMC vii) Lactose viii) Mannitol ix) Sucrose x) Talc xi) Chitin xii) Gelatin xiii) Agar xiv) Methyl cellulose xv) Pectin xvi) Alginic acid
 - Ointment bases, Suppository bases and Hardening agents:
 - i) Lanolin ii) Beeswax iii) Cocoa Butter iv) Hard paraffin v) Petroleum jelly.
 - Flavours and Perfumers: i) Cardamom oil ii) Vanilla iii) Lemon oil iv) Orange oil v) Sandal wood oil vi) Palmarosa oil vii) Geranium oil viii) Rose oil ix) Patchouli oil.

Natural Sweeteners:

- a) Definition of Nutritive and Non nutritive sweeteners with examples.
- b) Biological source, chemical structure with description of structural features, sweetness potency, extraction details and usage of following i) Stevioside ii) Rebaudioside iii) Glycyrrhizin.

Natural Colourants:

- a) General Introduction.
- b) Biological source, colouring principle(s) chemical nature and usage of following.
 - i) Saffron ii) Cochineal iii) Beet juice iv) Paprika v) Turmeric vi) Henna

Recommended Books: (Latest Editions)

1. Panda H. Herbal Cosmetics (Handbook), Asia Pacific Business Press Inc, New Delhi.
2. Thomson EG. Modern Cosmetics, Universal Publishing Corporation, Mumbai.
3. P.P.Sharma. Cosmetics - Formulation, Manufacturing & Quality Control, Vandana Publications, New Delhi.
4. Supriya K B. Handbook of Aromatic Plants, Pointer Publishers, Jaipur.
5. Skaria P. Aromatic Plants (Horticulture Science Series), New India Publishing Agency, New Delhi.
6. Kathi Keville and Mindy Green. Aromatherapy (A Complete Guide to the Healing Art), Sri Satguru Publications, New Delhi.
7. Chattopadhyay PK. Herbal Cosmetics & Ayurvedic Medicines (EOU), National Institute of Industrial Research, Delhi.
8. Balsam MS & Edward Sagarin. Cosmetics Science and Technology, Wiley Interscience, New York.
9. Herbal drug industry by R.D. Choudhary, 1st edition, eastern publisher, New Delhi: 1996.
10. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine Business horizons, New

- Delhi, First edition, 2003. Robert Verpoorte, Pulok K Mukharjee.
11. Quality control of herbal drugs by Pulok K Mukharjee, Ist edition, Business horizons Pharmaceutical publisher, New Delhi, 2002.
 12. PDR for herbal medicines, 2nd edition, medicinal economic company, New Jersey, 2000.
 13. Indian Herbal Pharmacopoeia, Vol.1&2, RRL, 1DMA, 1998, 2000.
 14. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae, 4th edition, Nirali Prakashan, 1996. Text book of Pharmacognosy and Phytochemistry by Rangare.
 15. Plant drug analysis 2nd edition by Wagner, Bladt.
 16. Biological standardization by J.N.Barn, D.J.Finley and L.G. Good win Stanbury P.F., Whittaker A., Hall S.J., Principles of Fermentation Technology 2 ndEdition.
 25. Operational Modes of Bioreactors, (1992) BIOTOL series, Butterworths Heinemann. Peppler H. J. and D. Perlman (1970) Microbial Technology Volume 1 and 2, Academic Press New York
 Wiseman A.(1985) Topics in Enzyme and Fermentation - Biotechnology, Vol. 1 and 2, John Wiley and Sons, New York. Industrial Microbiology By:A.H.Patel Industrial Microbiology
 By: L.E.Casida. Prescott and Dunns Industrial microbiology.By;Gerald Reed. Advances in Applied microbiology.By:D.Pearlman academic press.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.Pharm 2nd

Subject: Phytotherapy and Clinical Application of Medicinal Plants

Total Theory period: 50

Total marks in the end Semester: 100

Minimum of class test to be conducted: 2

Branch: Pharmacy

Subject Code: 5108212(041)

Total Tutorial period: 12

Unit I:

Phytotherapy

Concepts, history, importance and clinical indications. Research and generation of vegetable – origin drugs. Interdisciplinary with non-conventional and alternative therapies. Phytotherapy in basic health care and improvement of quality of life.

Unit II:

Phytomedicine

Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) for following indications

- GIT – Diabetes, Liver, Constipation, Diarrhoea, Dysentery.
- CVS – Hypertension, Angina
- RS – Bronchitis, Asthama, Antitussive
- CNS – Pain, Fever, Anxiety Convulsions
- Skin – Leucoderma
- Cardiovascular diseases
- Rheumatic diseases
- Enhancing immune system (especially panaceas, adaptogens and tonics)

Unit III:

Pharmacovigilance and Toxicology of Drugs of Natural Origin

- WHO and AYUSH guidelines for safety monitoring of natural medicine
- Spontaneous reporting schemes for bio-drug adverse reactions
- Toxic plants, Toxicity of Medicinal Plants, Herbal Remedies and their main metabolites.
- Intoxication symptoms and diagnostic for treatment.

Unit IV:

Biological Screening of Herbal Drugs

- Introduction and Need for Phyto-Pharmacological Screening
- In vitro evaluation techniques for Antioxidants, Antimicrobial and Anticancer drugs
- In vivo evaluation techniques for Anti-inflammatory, Antiulcer, Anticancer, Wound healing,
- Antidiabetic, Hepatoprotective, Cardio protective, Diuretics and Antifertility

Safety aspects:

- Protocols for assessing acute, sub-acute and chronic toxicity studies. Familiarization with AYUSH guidelines (Rule 170), CDCSO and OECD guidelines.

Unit V:

Clinical Trial and Biostatistics

- Computerized database creation of ethnopharmacologically proven Indian medicinal plants
- Standard deviation, standard error, coefficient of variation, correlation and regression; Tests of significance: t-test, normal curve test, F-test and modified F-test and chi-square test
- Pharmacoepidemiology: Observation cohort study; case control study; record linkage by computer

Recommended Books: (Latest editions)

1. Herbal medicine, 3rd edition (2007) Joanne Barnes, Linda A Anderson and J David Phillipson, Pharmaceutical Press ISBN 978 0 85369 6230
2. Natural Products from Plants, Kaufman, et al.
3. Medical Botany by Lewis and Elvin-Lewis

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.Pharm 2nd

Subject: Advances in Phytomedicine

Total Theory period: 50

Total marks in the end Semester: 100

Minimum of class test to be conducted: 02

Branch: Pharmacy

Subject Code: 5108213(041)

Total Tutorial period: 12

Unit I:

Recent advances in Pharmacognosy

- Role of biomarkers in crude drug analysis.
- Drug discovery from plant sources.
- Chemotaxonomy and Chemical ecology.
- NDDS of plant origin- Types & Importance of novel drug delivery systems in herbal medicines
- Applications of novel drug delivery system for herbal formulations

Unit II:

Introduction to Plant Biotechnology

- Prospects for development of plant biotechnology as a source of medicinal agents
- Applications in pharmacy and allied fields ,Genetic and molecular biology as applied to plant drugs, study of DNA, RNA and protein replication, genetic code, regulation of gene expression, and RAPD markers.
- DNA recombinant technology
- Plant tissue culture: Introduction, Laboratory requirements for plant tissue culture, culture media, callus culture, cell suspension culture, protoplast culture, industrial application of tissue culture.
- Production of secondary plant metabolites by tissue culture technique.
- Improvement of the yield, and factors effecting thereof.
- Fermentation technology: Introduction, Production of secondary plant metabolites by fermentation technology including design and operation of industrial fermentors and Detailed study of production of Ergot alkaloids.

Unit III:

Marine Natural Products

- A brief account of natural products derived from Marine source with special reference to Cardiovascular, anti-cancer, anti-viral, anti-microbial anti-parasitic, anticoagulant and anti-inflammatory agents.
- Study of Marine toxins
- Recent advances in research in marine drugs
- Problems faced in research on marine drugs such as taxonomical identification Chemical screening and their solution

Unit IV:

Nutraceuticals

- Nutraceuticals: Occurrence and Characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following.
 1. Carotenoids – i) α and β - Carotene ii) Lycopene iii) Xanthophyll (Lutein)

2. Limonoids – i) d-Limonene ii) α - Terpineol
3. Saponins – i) Glycyrrhizin ii) Shatavarins
4. Flavonoids – i) Rutin ii) Hesperidin iii) Naringin v) Quercetin
5. Phenolic acids:- Ellagic acid

Unit IV:

Cosmetics

Cosmetics preparations: Incorporating the herbal extracts in various cosmetic formulations like Skin care preparations (Creams and Lotions), Sunscreens and Sunburn applications, Hair care preparations (Hair oils and Hair shampoos) and Beautifying preparations (Lipsticks, Face powders and Nail polish).

References:

1. Trease and Evans Pharmacognosy, W.C. Evans.
2. Pharmacognosy, Varro E. Tyler, Lynn. R. Brady, James E. Robbers
3. Text Book of Pharmacognosy, T.E. Wallis, CBS Pub. Delhi.
4. Ramstad - Modern Pharmacognosy.
5. John - Dodds - Lorin - Experiments in Plant Tissue Culture.
6. CSIR- Cultivation and Utilization of Medicinal Plants.
7. Handa S.S. & Kaul. K.L. Supplement to cultivation & utilization of medicinal plants.
8. CSIR - Wealth of India, Raw Materials.
9. Bartz - Reinhard - Zenk - Plant Tissue Culture and its Biotechnical Applications.
10. Pharmacognosy, C.K. Kokate, A.P. Purohit, and S.B. Gokhale.
11. Quality Standards of Indian Medicinal Plants Vol-I, ICMR, New Delhi.
12. WHO guide lines for the quality control of Herbal plant materials.
13. The Practical evaluation of phytopharmaceutical by brain & turner.
14. Harborne - Comparative Biochemistry of Flavonoids.
15. Biological standardization by J.N. Barn, D.J. Finley and L.G. Goodwin.
16. Indian pharmacopoeia, Indian Herbal Pharmacopoeia and other pharmacopoeia.
17. Ayurvedic Formulary of India.
18. British Herbal Pharmacopoeia
19. Fingerprinting analysis and quality control methods of herbal medicines Pandey R, Saraf S, Shukla SS Jain P, Jain V Vyas A CRC Press Taylor & Francis group F.L.
20. Screening methods of Pharmacology By Robert turner.
21. Herbal Cosmetics - H. Pande, Asia Pacific Business press, New Delhi.
22. H. Pande, "The complete technology book on herbal perfumes and cosmetics", National Institute of Industrial Research, Delhi.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.Pharm 2nd

Subject: Natural Medicines of Traditional Origin and IPR

Total Theory period: 50

Total marks in the end Semester: 100

Minimum of class test to be conducted: 02

Branch: Pharmacy

Subject Code: 5108214(041)

Total Tutorial period: 12

Unit I:

Historical review

- Conventional and traditional systems of medicine Contribution of medicinal plants to Modern (western) medicine
- Fundamental concepts of Ayurveda, Siddha, Unani and Homoeopathy systems of medicine Different dosage forms of the ISM
- **Ayurveda:** Ayurvedic Pharmacopoeia, Analysis of formulations and bio crude drugs with references to: Identity, purity and quality
- **Homeopathy:** Definition, concept, evidence, indications and safety, Materia medica and other references, Examples of homeopathic preparations and indications
- **Siddha:** Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/Jeevam in Siddha system of medicine, Purification process (Suddhi)

Unit II:

- **Naturopathy, Yoga and Aromatherapy Practices**
- **Naturopathy:** Introduction, basic principles and treatment modalities
- **Yoga:** Introduction and Streams of Yoga, Asanas, Pranayama, Meditations and Relaxation techniques
- **Aromatherapy:** Introduction, Definition, concept, evidence, indications and safety, aromatherapy in practice, aroma oils for common problems, carrier oils

Unit III:

- Formulation Development of Various Systems of Medicine
- Salient features of the techniques of preparation of some of the important class of Formulations as per Ayurveda, Siddha, Homeopathy and Unani Pharmacopoeia and texts
- Standardization, Shelf life and Stability studies of ISM formulations

Unit IV:

Ethnobotany and Ethnopharmacology

- Role of Ethnopharmacology & Ethnobotany in drug evaluation
- Impact of Ethnobotany in traditional medicine
- Main native and exotic species popularly used in India.
- New development in herbals
- Bio-prospecting tools for drug discovery and theoretic and methodological aspects of ethnobotany and ethnopharmacology in bio prospection and preservation of biodiversity. Ethical and legal aspects
- Tribal medicine: Principles and Importance Tribal Medicines.
- Reverse Pharmacology

Unit V:

- **IPR & Patents:** Indian and international patent laws, proposed amendments as applicable to herbal/natural products and process.

Recommended Books: (Latest editions)

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

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.Pharm 2nd

Subject: Herbal Drug Development (Lab)

Total marks in the end Semester: 100

Branch: Pharmacy

Subject Code: 5108221(041)

Total Practical period: 72

List of Experiments:-

1. Preparation of at least three extracts by employing Green Technology.
2. Preparation of monoherbal formulations and its evaluations.
3. Preparation of polyherbal formulations and its evaluations.
4. Extraction of volatile oils from at least three plant species.
5. Spectroscopic/HPLC analysis of some isolated compounds.
6. Estimation of phytoconstituents in mono and polyherbal formulations.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)

Semester: M.Pharm 2nd

**Subject: Phytotherapy and Clinical Application of
Medicinal Plants (Lab)**

Total marks in the end Semester: 100

Branch: Pharmacy

Subject Code: 5108222(041)

Total Theory period: 75

List of Experiments:-

Biological Screening of Herbal Drugs

- To perform *in vitro* antioxidant and antimicrobial analysis of some herbal drugs and formulations
- To perform *in vivo* evaluation of anthelmintic, anti-inflammatory, antidiabetic, hepatoprotective, and diuretic activity.

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Semester: M.Pharm 2nd

Subject: Advances in Phytomedicine (Lab)

Total marks in the end Semester: 100

Branch: Pharmacy

Subject Code: 5108223(041)

Total Practical period: 75

List of Experiments:-

Isolation of known marker compounds by column chromatography and tissue culture

- Preparation of culture media, selection and preparation of ex-plant, callus culture.
- Isolation of enzymes from suitable source, and their immobilization.

Formulation and standardization of at least five important herbal cosmetics with different applications.



Chhattisgarh Swami Vivekanand Technical University (CSV TU), Bhilai (CG)

Scheme of Teaching and Examination

Courses of Study and Scheme of Examination of Master of Pharmacy (Phytomedicine)

Semester – III

S. No.	Board of Study	Subject	Subject Code	Period per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
							Theory/Practical				
				L	T	P	ESE	CT	TA		
1	Pharmacy	Minor Dissertation (Synopsis Submission) Seminar & Viva	5108321 (041)	-	03	36	300	-	100	400	-
Total				-	03	36	300	-	100	400	-

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment



Chhattisgarh Swami Vivekanand Technical University (CSV TU), Bhilai (CG)

Scheme of Teaching and Examination

Courses of Study and Scheme of Examination of Master of Pharmacy (Phytomedicine)

Semester – IV

S. No.	Board of Study	Subject	Subject Code	Period per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
							Theory/Practical				
				L	T	P	ESE	CT	TA		
1	Pharmacy	Major Dissertation (Seminar & Viva)	5108421 (041)	-	03	36	400	-	200	600	-
Total				-	03	36	400	-	200	600	-

L-Lecture, T-Tutorial, P-Practical, ESE-End Semester Exam, CT- Class Test, TA-Teacher's Assessment