

# **UNIVERSITY OF MUMBAI**



**Syllabus for the F.Y., S.Y. and T.Y. B.Voc**

**Program: B.Voc**

**Course : PHARMA ANALYTICAL  
SCIENCES**

(Credit Based Semester and Grading System with  
effect from the academic year 2015–2016)

## **Preamble:**

### **Indian Pharmaceutical industry:**

India accounts for 7% of the GDP by chemical sector and 11% of the national export. There are about 20000 registered pharmaceutical units in India and there are about 250 large units, 8000 small scale units and 5 central public sector units. Additionally, the size of the Indian diagnostic and lab services is about 160 billion.

Not marred by recession or inflation, the pharma sector has a competitive advantage of prospering steadily and thus attracts lots of young professionals looking at pharmaceutical as their prospective career option. With the expected growth rate of 14% per annum, Indian Pharmaceutical sector is expected to create more jobs in India in near future and add 45,000 fresh openings to its current strength.

Since 2009-10 more than 900 new drug approvals have been given by the Indian drug regulator. The regulatory guidelines have been revised since the Supreme Court directives in 2011-12. Regulatory requirements are increasing in production, quality control and R & D laboratories. Therefore, the regulatory department in a Pharmaceutical company not only needs a very broad understanding of the regulatory requirements but also must understand the chemical processes of production and quality control, the analytical tests, the pre-clinical studies and the clinical trial reports. Further there is an international strategy to harmonize the guidelines using ICH. With about 25 leading pharmaceuticals and about 100 smaller units involved in exports the requirement of regulatory executives is constantly increasing. Some of the top Indian pharmaceuticals have more than 75 executives employed in the regulatory department alone.

### **The need to develop trained employable human resource:**

The Indian Pharmaceutical and Chemical Industry have always been experiencing a dearth of skilled and industrially oriented human resource. The Industry despite employing students from chemistry, biology and pharmacy background always spends 6 months to one year for training the students for general industry needs like Good Laboratory Practices, Good Documentation Practices and regulatory compliances. The important component of knowledge and implementation of quality in laboratory analysis is scarce in the graduates of chemistry and pharmacy. The skilled manpower requirement is in the areas of R & D, quality assurance and intellectual property. The Pharmaceutical industry sector in India is the one of the strong Export oriented sectors that needs to comply with a multitude of regulatory compliances for marketing the drug formulations abroad. In India itself, the sector needs to comply to stringent regulatory compliances and audits before the drug formulations are marketed. The training in practice of GLP as per the current regulatory requirements is missing. This course will provide manpower that is work-ready.

## Objectives of the Course

The course will address the requirements of conducting, managing and meeting regulatory requirements for R & D and testing laboratories in pharmaceutical and chemical industries. Major hurdle faced by the R&D centers at various Pharma laboratories is the lack of adequately trained and GLP oriented personnel. This forms a major setback when the application of sophisticated technology especially in the bio analytical field is concerned. The lacunae become more evident when dealing with newer dosage forms and peptide based drugs. This lacunae needs to be addressed very diligently and the proposed programme is a step in this direction

The program will have the following objectives;

- To develop trained manpower in the field of Pharma Analytical Sciences with specific emphasis for instrumentation skills needed for analysis
- To amalgamate knowledge of classical analytical techniques with modern sophisticated instrumentation and provide training in the analysis of chemicals, drugs, food and other products.
- To introduce the training with powerful tools of instrumentation analysis in routine analysis at manufacturing, QC and research
- To provide exposure to National & International regulatory requirements with reference to drugs and chemicals
- To provide training in skills of analysis and develop knowledgeable and employable human resource
- To provide training in soft skills for efficient communication, technical writing, entrepreneurship and basic business management,

### O. \_\_\_\_\_ Eligibility:

- Higher Secondary School Certificate (10 + 2), Science or its equivalent.
- No age bar

### R. \_\_\_\_\_ Duration: SIX semesters (Three Years)

R. \_\_\_\_\_ **No of Lectures:** 7 theory papers each semester equivalent to 2 credits each.  
30 lectures for each paper per semester.

R. \_\_\_\_\_ **No of Practical periods:** 2 practical papers each semester equivalent to 10 credits each.  
300 hours for each practical per semester.

R. \_\_\_\_\_ **No. of credits:** 18 credits of Skill component and 12 credits of general education component at each semester. Total 30 credits per semester.

**Work Load** : Two periods per week per paper where each period is of ONE hour duration  
Twenty practical per week. Each practical is of Four periods where each period is of ONE hour duration.  
One Seminar / assignment per Week. Each seminar is of ONE hour  
Guidance to the students for assignments / projects / industrial visits / industrial training.

R. \_\_\_\_\_ **Passing Standard** : Minimum 25 % marks in each paper and each practical and minimum 40 % marks in aggregate in Theory and Practical separately.

**Number of Students** 15 per batch

R. \_\_\_\_\_ The following will be the **staffing pattern** for the course;

- Instrument technician – 01
- Technical Assistant – 02
- Teaching staff – 03 (full time)  
and remaining workload to be completed using guest faculty.

### **Faculty**

Post-graduate degree in the subject of Chemistry / Botany / Zoology, Microbiology / Biochemistry / Biotechnology with B+ and NET / SET as per the current University guidelines

### **Visiting Faculty from Industry & Research Institutes**

The visiting Faculty will be from a post equivalent to that of Associate Professor level with Ph. D and not less than 5 years of research experience or with experience in industry not below Assistant Manager Level.

R. \_\_\_\_\_ **Mark-list**

- The mark-list of the students must indicate titles of papers in the syllabus

R.\_\_\_\_\_ details of the Syllabus

**University of Mumbai**  
**Credit Based, Semester & Grading System**  
**SYLLABUS IN BRIEF : B.VOC, PHARMA ANALYTICAL SCIENCES :**

**Semester - I**

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS101	Preparation of standard solutions and reagents	2	30	2
UVPAS102	Analytical applications of molecules and molecular Interactions	2	30	2
UVPAS103	Applied physical principles in instrumentation	2	30	2
UVPAS104	Introduction to data , data collection (sampling) and computation	2	30	2
UVPASP101	Practical based on Skill Components Industrial visits and assignments	10	300	10
<b>General Education Component</b>				
UVPAS105	Basic Chemistry and Chemical Interactions	2	30	2
UVPAS106	Chemistry and properties of solutes, solvents and solutions	2	30	2
UVPAS107	Skills of speaking and listening skills in communication	2	30	2
UVPASP102	Practical based on General Education Components	10	300	10

**University of Mumbai**  
**Credit Based, Semester & Grading System**  
**SYLLABUS IN BRIEF : B.VOC, PHARMA ANALYTICAL SCIENCES :**

**Semester - II**

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS201	Preparation of standard solutions and reagents - 2	2	30	2
UVPAS202	Analytical applications of molecules and molecular Interactions - 2	2	30	2
UVPAS203	Applied physical principles in instrumentation - 2	2	30	2
UVPAS204	Introduction to data , data collection (sampling) and computation - 2	2	30	2
UVPASP201	Practical based on Skill Components Industrial visits and assignments	10	300	10
<b>General Education Component</b>				
UVPAS205	Basic Chemistry and Chemical Interactions - 2	2	30	2
UVPAS206	Chemistry and properties of solutes, solvents and solutions - 2	2	30	2
UVPAS207	Skills of speaking and listening skills in communication - 2	2	30	2
UVPASP202	Practical based on General Education Components	10	300	10

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**Credit Based, Semester & Grading System**  
**SYLLABUS IN BRIEF : B.VOC, PHARMA ANALYTICAL SCIENCES :**

**Semester - III**

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS301	Basic techniques of recording laboratory data for QA	2	30	2
UVPAS302	Basics of separation techniques and laboratory analysis	2	30	2
UVPAS303	Sample preparation, storage and extraction techniques	2	30	2
UVPAS304	Statistical Evaluation and Data Management	2	30	2
UVPASP301	Practical based on Skill Components Industrial visits and assignments	10	300	10
<b>General Education Component</b>				
UVPAS305	Interactions between solutes, solvents & matrix components	2	30	2
UVPAS306	Analytical techniques for organic Compounds and natural products	2	30	2
UVPAS307	Skills of Technical writing and laboratory automation	2	30	2
UVPASP302	Practical based on General Education Components	10	300	10

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**SYLLABUS IN BRIEF : B.VOC, PHARMA ANALYTICAL SCIENCES :**

**Semester - IV**

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS401	Basic techniques of recording laboratory data for QA – 2	2	30	2
UVPAS402	Basics of separation techniques and laboratory analysis – 2	2	30	2
UVPAS403	Sample preparation, storage and extraction techniques – 2	2	30	2
UVPAS404	Statistical Evaluation and Data Management – 2	2	30	2
UVPASP401	Practical based on Skill Components Industrial visits and assignments	10	300	10
<b>General Education Component</b>				
UVPAS405	Interactions between solutes, solvents & matrix components – 2	2	30	2
UVPAS406	Analytical techniques for organic Compounds and natural products – 2	2	30	2
UVPAS407	Skills of Technical writing and laboratory automation – 2	2	30	2
UVPASP402	Practical based on General Education Components	10	300	10



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**Credit Based, Semester & Grading System**  
**SYLLABUS IN BRIEF : B.VOC, PHARMA ANALYTICAL SCIENCES :**

**Semester - V**

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS501	Analysis of samples of food, cosmetics and drugs	2	30	2
UVPAS502	Advanced techniques of analysis	2	30	2
UVPAS503	Automation of laboratory data and their management	2	30	2
UVPAS504	Industrial Training/Internship /project assignments	2	30	2
UVPASP501	Practical based on Skill Components Industrial visits and assignments	10	300	10
<b>General Education Component</b>				
UVPAS305	Applied molecular biology in analysis	2	30	2
UVPAS506	Pharmaceutical biochemistry and applications	2	30	2
UVPAS507	Entrepreneurship skills and project management	2	30	2
UVPASP502	Practical based on General Education Components	10	300	10

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**SYLLABUS IN BRIEF : B.VOC, PHARMA ANALYTICAL SCIENCES :**

**Semester - VI**

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS601	Analysis of samples of food, cosmetics and drugs – 2	2	30	2
UVPAS602	Advanced techniques of analysis – 2	2	30	2
UVPAS603	Automation of laboratory data and their management - 2	2	30	2
UVPAS604	Industrial Training/Internship /project assignments – 2	2	30	2
UVPASP601	Practical based on Skill Components Industrial visits and assignments	10	300	10
<b>General Education Component</b>				
UVPAS605	Applied molecular biology in analysis – 2	2	30	2
UVPAS606	Pharmaceutical biochemistry and applications – 2	2	30	2
UVPAS607	Entrepreneurship skills and project management – 2	2	30	2
UVPASP602	Practical based on General Education Components – 2	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS101	Preparation of standard solutions and reagents	2	30	2
	<ul style="list-style-type: none"> <li>Units of weights and measurements – concept of normality, molarity and molality</li> <li>Concept of standard solution and their applications</li> </ul>			
UVPAS102	Analytical applications of molecules and molecular Interactions	2	30	2
	<ul style="list-style-type: none"> <li>Concept of atomic mass, atomic number, isotopes and isomers</li> <li>Concept of Ka, Kb and Km (enzymes) and their applications</li> </ul>			
UVPAS103	Applied physical principles in instrumentation	2	30	2
	<ul style="list-style-type: none"> <li>Concept of electromagnetic spectrum and applications related to various spectral regions</li> <li>Concept of Dispersion of light and scattering of light and their applications</li> </ul>			
UVPAS104	Introduction to data , data collection (sampling) and computation	2	30	2
	<ul style="list-style-type: none"> <li>Concept of sample , sample statistic and population statistics</li> <li>Basic Sampling techniques and their application in pharma</li> </ul>			
UVPASP101	Practical based on Skill Components Industrial visits and assignments	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>General Education Component</b>				
UVPAS105	Basic Chemistry and Chemical Interactions	2	30	2
	<ul style="list-style-type: none"> <li>• Atomic Structure, Molecules and ions</li> <li>• Chemical Bonds and Chemical Reactions</li> </ul>			
UVPAS106	Chemistry and properties of solutes, solvents and solutions	2	30	2
	<ul style="list-style-type: none"> <li>• Concept of solubility, partition and their applications</li> <li>• Water as a universal solvent in living systems</li> </ul>			
UVPAS107	Skills of speaking and listening skills in communication	2	30	2
	<ul style="list-style-type: none"> <li>• General inter personal communications</li> <li>• General official communications</li> </ul>			
UVPASP102	Practical based on General Education Components	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS201	Preparation of standard solutions and reagents - 2	2	30	2
	<ul style="list-style-type: none"> <li>Principles in the use of indicators, colour reagents and derivatizing agents</li> <li>Dilutions and dilution techniques and their applications</li> </ul>			
UVPAS202	Analytical applications of molecules and molecular Interactions - 2	2	30	2
	<ul style="list-style-type: none"> <li>Chemical reactions and equilibrium</li> <li>Radioisotopes, labeled/tagged probes in bioanalysis (including ELISA)</li> </ul>			
UVPAS203	Applied physical principles in instrumentation - 2	2	30	2
	<ul style="list-style-type: none"> <li>Various properties of light and their applications in measurement</li> <li>Concept of monochromatic light, LASER and their uses</li> </ul>			
UVPAS204	Introduction to data , data collection (sampling) and computation - 2	2	30	2
	<ul style="list-style-type: none"> <li>Concepts of Quantitative data, qualitative data and their statistical evaluation</li> <li>Applications of various data representation techniques</li> </ul>			
UVPASP201	Practical based on Skill Components Industrial visits and assignments	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>General Education Component</b>				
UVPAS205	Basic Chemistry and Chemical Interactions - 2	2	30	2
	<ul style="list-style-type: none"> <li>• Catalysts and their roles in reactions</li> <li>• Basic Concepts of enzymes and enzymatic reactions</li> </ul>			
UVPAS206	Chemistry and properties of solutes, solvents and solutions - 2	2	30	2
	<ul style="list-style-type: none"> <li>• Properties of solvents and their applications</li> <li>• Concept of pH, buffers and their applications</li> </ul>			
UVPAS207	Skills of speaking and listening skills in communication - 2	2	30	2
	<ul style="list-style-type: none"> <li>• Techniques of effective expression of ideas</li> <li>• General written communications</li> </ul>			
UVPASP202	Practical based on General Education Components	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS301	Basic techniques of recording laboratory data for QA	2	30	2
	<ul style="list-style-type: none"> <li>• Concepts of QA and QC and their significance</li> <li>• GLP and its practice</li> </ul>			
UVPAS302	Basics of separation techniques and laboratory analysis	2	30	2
	<ul style="list-style-type: none"> <li>• Types of chromatographic separations and their applications</li> <li>• Introduction to separation techniques other than chromatography</li> </ul>			
UVPAS303	Sample preparation, storage and extraction techniques	2	30	2
	<ul style="list-style-type: none"> <li>• Sample storage and sample processing</li> <li>• Various extraction techniques and their role in separation</li> </ul>			
UVPAS304	Statistical Evaluation and Data Management	2	30	2
	<ul style="list-style-type: none"> <li>• Data analysis for sample statistics</li> <li>• Concept of sample size and its importance in managing variability</li> </ul>			
UVPASP301	Practical based on Skill Components Industrial visits and assignments	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>General Education Component</b>				
UVPAS305	Interactions between solutes, solvents & matrix components	2	30	2
	<ul style="list-style-type: none"> <li>• Partition coefficient and its applications</li> <li>• Selection of methods based on different matrices</li> </ul>			
UVPAS306	Analytical techniques for organic Compounds and natural products	2	30	2
	<ul style="list-style-type: none"> <li>• Analytical techniques involving biological matrices and macromolecules</li> <li>• Analysis based on various properties of organic compounds and macromolecules</li> </ul>			
UVPAS307	Skills of Technical writing and laboratory automation	2	30	2
	<ul style="list-style-type: none"> <li>• Test reports and their formats</li> <li>• Autosamplers as simple automation devices</li> </ul>			
UVPASP302	Practical based on General Education Components	10	300	10



Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS401	Basic techniques of recording laboratory data for QA – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Concept of TQM and role of analyst</li> <li>• Quality of data and significance of data integrity</li> </ul>			
UVPAS402	Basics of separation techniques and laboratory analysis – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Instrumentation and their working in Chromatographic separation</li> <li>• Instrumentation and their working in separation techniques other than chromatography</li> </ul>			
UVPAS403	Sample preparation, storage and extraction techniques – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Sample pre-treatment techniques</li> <li>• Solid phase extraction &amp; automation in sample treatment</li> </ul>			
UVPAS404	Statistical Evaluation and Data Management – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Comparison of samples</li> <li>• Concept of significance and confidence intervals</li> </ul>			
UVPASP401	Practical based on Skill Components Industrial visits and assignments	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>General Education Component</b>				
UVPAS405	Interactions between solutes, solvents & matrix components – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Concept of resolution, selectivity and specificity of analysis</li> <li>• Importance of solute-solvent interaction in various analysis</li> </ul>			
UVPAS406	Analytical techniques for organic Compounds and natural products – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Analytical techniques for minerals, oils and phytochemicals</li> <li>• Analytical techniques for polymers, dyes and pesticides</li> </ul>			
UVPAS407	Skills of Technical writing and laboratory automation – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Technical writing styles and reports</li> <li>• Liquid handling systems and automated work stations</li> </ul>			
UVPASP402	Practical based on General Education Components	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS501	Analysis of samples of food, cosmetics and drugs	2	30	2
	<ul style="list-style-type: none"> <li>Analytical techniques for food products</li> <li>Various analytical techniques for of drugs and cosmetics</li> </ul>			
UVPAS502	Advanced techniques of analysis	2	30	2
	<ul style="list-style-type: none"> <li>Hyphenated techniques in analysis- 1</li> <li>Applications of atomic properties for analysis - 1</li> </ul>			
UVPAS503	Automation of laboratory data and their management	2	30	2
	<ul style="list-style-type: none"> <li>Laboratory information systems and their significance</li> <li>E-records and their management</li> </ul>			
UVPAS504	Industrial Training/Internship /project assignments	2	30	2
	<ul style="list-style-type: none"> <li>Students will be completing an assignment at an industrial unit (min 45 days)</li> </ul>			
UVPASP501	Practical based on Skill Components Industrial visits and assignments	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>General Education Component</b>				
UVPAS505	Applied molecular biology in analysis	2	30	2
	<ul style="list-style-type: none"> <li>• PCR and its applications</li> <li>• Restriction enzymes and their applications</li> </ul>			
UVPAS506	Pharmaceutical biochemistry and applications	2	30	2
	<ul style="list-style-type: none"> <li>• Different pharmaceutical preparations and their applications</li> <li>• Analysis of excipients and their significance</li> </ul>			
UVPAS507	Entrepreneurship skills and project management	2	30	2
	<ul style="list-style-type: none"> <li>• Initiating and sustaining start-up projects in analytical services</li> <li>• Planning and financing start-up projects</li> </ul>			
UVPASP502	Practical based on General Education Components	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>Skill Component</b>				
UVPAS601	Analysis of samples of food, cosmetics and drugs – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Residue analysis in finished products</li> <li>• Regulatory analysis of consumer products</li> </ul>			
UVPAS602	Advanced techniques of analysis – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Hyphenated techniques in analysis – 2</li> <li>• Applications of atomic properties for analysis – 2</li> </ul>			
UVPAS603	Automation of laboratory data and their management – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Compliance to CFR part 11</li> <li>• Data integrity, security and archival</li> </ul>			
UVPAS604	Industrial Training/Internship /project assignments – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Students will be completing an assignment at an industrial unit (min 45 days)</li> </ul>			
UVPASP601	Practical based on Skill Components Industrial visits and assignments	10	300	10

Code	Paper	Credits	Lectures	L/Wk
<b>General Education Component</b>				
UVPAS605	Applied molecular biology in analysis – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Nano particles and their applications</li> <li>• Techniques in proteomics</li> </ul>			
UVPAS606	Pharmaceutical biochemistry and applications – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Drug delivery systems and their applications</li> <li>• Analytical approach to standardising drug delivery systems</li> </ul>			
UVPAS607	Entrepreneurship skills and project management – 2	2	30	2
	<ul style="list-style-type: none"> <li>• Management project timelines and deliveries</li> <li>• Management of finances and other resources</li> </ul>			
UVPASP602	Practical based on General Education Components – 2	10	300	10

## **Practical:**

### **Orientation practical : It will include introduction to Indian Pharmacopoeia, its parts, its use in the context of drugs and cosmetic act**

1. Preparation of Normal solution, molar solution, molal solution
2. Identification of Laboratory glassware & Micropipetting
3. Use of Analytical balance, Monopan balance & calibrated weight box
4. Washing of laboratory glass ware chromic Acid preparation & use
5. Introduction, Lab note book, dress code, safety shower etc.
6. Instrument Identification, Usage logs, SOP, Calibration / Maintenance Records, IQ, OQ, PQ concepts
7. Distilled Water & distillation unit
8. Calibration & Preventive maintenance -- Balance, micropipette, pH meter, Colorimeter, Muffale furnace
9. Recording of Temperature & Humidity.
10. COA & documentation for sample identification & record
11. a) Stability chamber & its use  
b) Deep freezers -  $-20^{\circ}\text{C}$ ,  $-85^{\circ}$  & their usage
12. Preparation of  $\text{PO}_4$  buffer & bicarbonate buffer
13. Preparation of Mobile phase for chromatography (use of separating Funnel )

14. Paper chromatographic separation of Amino acids, formulation:-
15. TLC on glass plate for fatty acids with iodine vapour visualization
16. Al. plate TLC for various compounds
  - a) Direct visualization
  - b) derivatisation
  - c) uv visualization
17. Identification of best filter for colorimetry of given colored solution
18. Identification of T max of given sample (demonstration & interpretation of Spectrogram)
19. Tabet - Physical assays – Uniformity of wt
20. - Hardness
21. - friability
22. Total Ash,
23. Total organic content
24. Alcohol soluble, water soluble, Acid in soluble – etc (Proximate)
25. ELISA & its Usage
26. Colorimetric Estimation of glucose
27. Colorimetric estimation of – from formulation
28. Calculation of Mean, SD, C V
29. Graphical re-presentation
30. Calculation of A N O V A, student t test



31. Scatter diagram, Trend line, regression equation & correlation

Coefficient

32. Audit of laboratory notes

33. Laboratory Safety signs & meaning, making laboratory signs

34. Fire fighting – usage of fire Extinguisher & its types

35. Waste disposal bags, colors & meanings – Biohazard waste

36. Use of Scientific calculator Logarithm, Antilog, Mean & SD

37. Assignment of

a) Microsoft Power Point

b) Microsoft EXCEL

c) Microsoft Word & Conversion of PDF

38. – Filling of requisition Form,

-- Letter for Plasma

-- Spirit License & renewal

-- Request of Bio Waste disposal

-- Bio waste disposal – Agreement

39. Volumetric titration

- Acid base

- Precipitation

- With Eriochrome black T- indicator

- with pH meter

- Thermometer
- Semi micro analysis
- Organic Analysis
- Volumetric Glass ware & sieves
- Powder analysis
- Syrup – Viscosity
- Refractive Index
- Specific gravity
- Absorbance of – Water holding capacity
- Estimation of Moisture
- Acid value
- Saponification Value
- Iodine value
- Peroxide value
- Unsaponifiable matter
- Vitamin Assay
- Closure for injections
- Sterilization method
- Indicators
- Reference Substance

Basic Skills in Analytical Techniques and Practical Skills in following aspects of various analytical instruments:

- Instrumentation
- Working
- Sample Processing
- Analysis, On-Line trouble shooting
- Reporting
- Documentations

- IR Spectroscopy , FTIR
- HPTLC
- HPLC
- GC
- Introduction to CE
- Introduction to MS and Hyphenated techniques – LC-MS, GC-MS

The Scheme of Examination and Allotment of marks are tabulated below;

<b>B. VOC. (PHARMACEUTICAL ANALYSIS)</b>						
<b>FIRST YEAR (1000 MARKS PER SEMESTER)</b>						
<b>THEORY</b>				<b>PRACTICAL</b>		
<b>CODE</b>		<b>MARKS</b>	<b>(75:25) SCHEME</b>	<b>CODE</b>		
<b>MARKS</b>				<b>MARKS</b>		
<b>UVPAS101</b>	SC-1	80	60:20	<b>UVPASP101</b>	SP-1	100
<b>UVPAS102</b>	SC-2	80	60:20		SP-2	100
<b>UVPAS103</b>	SC-3	80	60:20		SP-3	100
<b>UVPAS104</b>	SC-4	80	60:20		SP-4	100
<b>UVPAS105</b>	GC-1	30	23:07	<b>UVPASP102</b>	GC-1	100
<b>UVPAS106</b>	GC-2	30	23:07		GC-2	100
<b>UVPAS107</b>	GC-3	20	15:05			
<b>TOTAL MARKS</b>		<b>400</b>		<b>600</b>		
<b>GRAND TOTAL</b>				<b>1000</b>		

**NOTE : SC= Skilled Component, GC= General Component**

<b>B. VOC. (PHARMACEUTICAL ANALYSIS)</b>						
<b>SECOND YEAR (1000 MARKS PER SEMESTER)</b>						
<b>THEORY</b>				<b>PRACTICAL</b>		
<b>CODE</b>		<b>MARKS</b>	<b>(75:25) SCHEME</b>	<b>CODE</b>		
<b>MARKS</b>				<b>MARKS</b>		
<b>UVPAS201</b>	SC-1	80	60:20	<b>UVPASP201</b>	SP-1	100
<b>UVPAS202</b>	SC-2	80	60:20		SP-2	100
<b>UVPAS203</b>	SC-3	80	60:20		SP-3	100
<b>UVPAS204</b>	SC-4	80	60:20		SP-4	100
<b>UVPAS205</b>	GC-1	30	23:07	<b>UVPASP202</b>	GC-1	100
<b>UVPAS206</b>	GC-2	30	23:07		GC-2	100
<b>UVPAS207</b>	GC-3	20	15:05			
<b>TOTAL MARKS</b>		<b>400</b>		<b>600</b>		
<b>GRAND TOTAL</b>				<b>1000</b>		

**NOTE : SC= Skilled Component, GC= General Component**

<b>B. VOC. (PHARMACEUTICAL ANALYSIS)</b>						
<b>THIRD YEAR (800 MARKS PER SEMESTER)</b>						
<b>THEORY</b>				<b>PRACTICAL</b>		
<b>CODE</b>		<b>MARKS</b>	<b>(75:25) SCHEME</b>	<b>CODE</b>		<b>MARKS</b>
<b>UVPAS301</b>	SC-1	80	60:20	<b>UVPASP301</b>	SC-1	120
<b>UVPAS302</b>	SC-2	80	60:20		SC-2	120
<b>UVPAS303</b>	SC-3	80	60:20		SC-3	120
<b>UVPAS304</b>	GC-1	80	25:15	<b>UVPASP302</b>	GC-1	120
<b>TOTAL MARKS</b>		<b>320</b>		<b>480</b>		
<b>GRAND TOTAL</b>				<b>800</b>		

**NOTE : SC= Skilled Component, GC= General Component**