Dayananda Sagar University

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Ref : DSU/Reg/2021-22/64

Date : 08.10.2021

NOTIFICATION

SUB : Scheme & Syllabus of BVoc - I & II Semesters in Pharmaceutical Manufacturing Technology Program of Dayananda Sagar University –Reg.,

Ref: Resolution of the Board of Governors passed at its 16th Meeting held on 24.09.2021

Pursuant to resolution passed by the Board of Governors, at it's 16th Meeting held on 24.09.2021, University is pleased to notify the Scheme & Syllabus of BVoc - I & II Semesters in Pharmaceutical Manufacturing Technology Program , which is applicable from the Academic Year 2020-21 , onwards.

By Order

Registrar

8/10/21.

CC: PS – Vice Chancellor / Pro Vice Chancellors /COE/CIO/CFO/ Deans/Principals / Chairpersons of Schools/Departments/Dean Research/Director IQAC

Enclosure: Scheme & Syllabus of BVoc - I & II Semester in Pharmaceutical Manufacturing Technology Program

DAYANANDA SAGAR UNIVERSITY

Shavige Malleshwara Hills, Kumaraswamy Layout,

Bengaluru - 560114, Karnataka.

SCHOOL OF ENGINEERING

SCHEME & SYLLABUS
FOR
BACHELOR OF VOCATION

SPECIALIZATION

PHARMACEUTICAL MANUFACTURING TECHNOLOGY

(I& II Sem)

08.10.2021

I SEMESTER

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CREDITS
1	P008	20VP101	ENVIRONMENTAL STUDIES	2
2	P008	20VP102	BASICS OF CGMPS	2
3	P008	20VP103	APPLIED NATURAL SCIENCE	2
4	P008	20VP104	APPLIED CHEMISTRY	2
5	P008	20VP105	ENGLISH SPOKEN	5
			TOTAL	13

II SEMESTER

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CREDITS
1	P008	20VP201	ENGINEERING DRAWING	1
2	P008	20VP202	OCCUPATIONAL HEALTH & SAFETY	4
3	P008	20VP203	PHARMA MANUFACTURING OPERATIONS	4
4	P008	20VP204	PHARMACEUTICAL CHEMISTRY	3
5	P008	20VP205	ENGLISH WRITTEN	3
			TOTAL	15

Curriculum Structure for SECOND Year
B.VOC. In Pharmaceutical Manufacturing Technology
AY: 2022-23

THIRD & FOURTH SEMESTER

III SEMESTER

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CREDITS
1	P008	20VP301	ENGINEERING DESIGN	1
2	P008	20VP302	PHARMACEUTICS-I	4
3	P008	20VP303	BIOCHEMISTRY AND CLINICAL PATHOLOGY	3
4	P008	20VP304	COMMUNITY PHARMACY	3
5	P008	20VP305	TECHNICAL COMMUNICATION	3
			TOTAL	14

IV SEMESTER

SL	PROGRAM CODE	COURSE CODE	COURSE TITLE	CREDITS
1	P008	20VP401	NUTRACEUTICALS & HERBAL DRUGS	1
2	P008	20VP402	PHARMACEUTICS-II	4
3	P008	20VP403	FORMULATIVE PHARMACY	4
4	P008	20VP404	BASICS OF MANUFACTURING AND PILOT PLANT SCALE-UP	4
5	P008	20VP405	PHARMACEUTICAL ENGINEERING	3
			TOTAL	**16**

Notes:

1. All the courses are integrated in nature; Both theory and practical are included.
2. Vocational Practical include on job, guided skill acquisition, in the industry.
3. Theory: 7 hours; One day @DSU.
4. Practical: 40 hours; Five Days; Guided and Monitored, Assigned Work @ Industry.

20VP101: Environmental Studies - 2 Credits		
Unit-I	**Introduction:** Scope and importance of environmental studies - Definition of environment - comprehensive understanding of environment **Basic Concepts of Environment:** 1. Types of xenobiotics: Chemical, Physical, Biological pollutants; Hazard & Risk 2. Eco-kinetic & Bio-kinetic Properties of a xenobiotic 3. Dose-Response Relationships-chronic and acute effects 4. Environmental Standards: AAQS, TLV's 5. Structure of Atmosphere; Atmospheric inversions	6 Hrs.
Unit-II	**Air Pollution:** Atmosphere and its structure **Criteria pollutants** –Particulate Matter, Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxide, Lead; SMOG & Air-pollution episodes **Aerosols:** Acid Rain Cycle	5 Hrs.
Unit-III	**Water Treatment** Hydrosphere Lentic and Lotic Water Systems Fresh Water as a resource; Rain Water Harvesting **Treatment of potable water** Water Standards	5 Hrs.
Unit-IV	**Waste water-** Characteristics, Industrial Effluents Municipal Sewage Water and Treatment **Wastes and Management of Waste** Biomedical Waste Solid Waste Management: Landfills, composting	6 Hrs.

Unit-V	**Energy:** Types of energy **Conventional sources of energy:** fossil fuel, Coal, Non-conventional sources of energy: Biofuels - biomass, biogas	4 Hrs.

Course Objectives:

(i) To expose engineering students to the basic concepts and principles of environment;
(ii) To have knowledge of the current issues' pollution endangering life on earth.
(iii) To educate about the environmental resources, energy, pollution, management and law.

Course Outcomes:

- Delineate basic concepts that govern environmental quality, atmospheric principles and environmental standards;
- Recognize and conversant with sources and nature of pollution types, control and management;
- Energy resource types and their environmental implications;
- Apply the process of environmental impact assessment and implications of Indian Environment Laws

Text Books

1. R.C. Gaur, Basic Environmental Engineering, New age international (P) limited, publishers, 2008
2. J. Glynn Henry and Gary. W. Heinke, Environmental Science and Engineering, Pretice Hall of India, 2004
3. P. Venugopala Rao, A Text Book of Environmental Engineering, PHI Learning Pvt. Ltd., 2012
4. Lecture Notes From Course Instructors

20VP102: Basics of cGMPs - 2 Credits		
Unit-I	**Basic Principles of GMP and cGMP** Law: Regulatory Bodies - Effect of Medicines: Why By Law? -GMP Legilsation - Purpose of law - Development of medicines - Current Good Manufacturing Practice in manufacturing, processing, packing, or holding of drugs - cGMP for finished pharmaceuticals - ICH: International Conference on Harmonization	5 Hrs.
Unit-II	**Quality Systems: 6 Components:** Quality, Production, Laboratory, Facilities and equipment, Packaging and Labeling **Definitions:** Component, Active ingredient, Excepient, Containers and Closures **Areas are involved:** Representative sampling procedures - Supplier validation and component testing- Rejecting components, containers and closures - handling operations - First in/First out procedures	6 Hrs.
Unit-III	**CGMP Regulations:** Organization and Personnel– Responsibilities of the Quality Control Unit **Holding and Distribution– Records and Reports**	5 Hrs.
Unit-IV	**Warehousing procedures - Distribution procedures** The Meaning and Importance of CGMP in Warehousing - Meeting CGMP Standards for Outsourced Warehouses - How Does a Warehousing Provider Qualify for CGMP? **General Requirements** - Components, Labeling - Scope and Application-- Materials Management Records	5 Hrs.
Unit-V	**The Pharmaceutical Industry's cGMP Regulations:** Processing, Packing, or Holding of Drugs - Finished Pharmaceuticals - Biological Products - Electronic Records and Signatures	5 Hrs.

Notes:

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For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.

Course Objectives:

- Importance of regulations
- Appreciate Quality Systems
- State the GMP requirements for documentation
- Explain the implications of GMP documents
- Understanding of complete batch records and associated supporting documents.

Course Outcome:

On successful completion of the course, the students will have ability to attain below:

- Define key terms for cGMP
- Demonstrate knowledge of Good Manufacturing Practices and its perspectives
- Demonstrate knowledge of Good Manufacturing Practice in global contexts.
- Understanding of GMP regulations of EU, FDA and WHO
- Knowledge of International Conference of Harmonization
- Recognize the role of the FDA
- Describe the different types of inspections
- Explain the Quality System

Suggested Student Activities

1. Collect different regulations, standards and guidances available from different authorities and making decisions in consultation with concerned industry personnel on what is "best-practice" and what is right for the organization.

2. Interpret the requirements of a regulatory guideline and to design, write and implement any one regulation-compliant quality system element in an organization;

3. Collect and observe a continuous improvement is fundamental to Good Manufacturing Practice. In the assessment you will apply the principles of continuous improvement to a industry based complaint management scenario

E – Learning Links:

https://www.fda.gov/media/92844/download

https://www.fda.gov/regulatory-information/search-fda-guidance-documents/part-11-electronic-records-electronic-signatures-scope-and-application

https://www.thebalancesmb.com/introduction-to-current-good-manufacturing-practices-cgmp-2221107

https://www.dcvmn.org/IMG/pdf/b1_02_general_introduction_international_laws.pdf

https://learnaboutgmp.com/elearning/21-cfr-part-211-subpart-e-control-of-components-and-drug-product-containers-and-closures/

https://www.apsfulfillment.com/warehousing-solutions/cgmp-warehousing/

Reference Books:

Cox Gad, Pharmaceutical Manufacturing Handbook Regulations and Quality Shayne,

2008 by John Wiley & Sons, Inc.

A Guide to Good Manufacturing Practices (GMP) Kindle Edition

by Emmet Tobin (Author) Format: Kindle Edition

Free Download:
The Certified Pharmaceutical GMP Professional Handbook PDF Free Download
https://lib-ebooks.com/the-certified-pharmaceutical-gmp-professional-handbook-pdf/

20VP103: Applied Natural Science: (Human Anatomy, Physiology and Medicinal Plants) - **2 Credits**		
Unit-I	**Animal Cell Structure and Division:** Anatomy and Division Cell Division, Mitosis, Meiosis **Transport Mechanisms:** Transport Mechanisms and Cell Permeability Passive Transport: Active Transport **Organization of the Human Body :** Anatomy Anatomic Position - Body Orientation and Direction	5 Hrs.
Unit-II	**Bone Classification and Structure :** Chemical Composition of Bone **The Axial Skeleton:** The Skull - The Vertebral Column - The Thoracic Cage **Gross Anatomy of the Muscular System** – Classification of Skeletal Muscles **The Histology of Nervous Tissue:** Neuron Anatomy - Structure of a nerve **Gross Anatomy of the Brain** Structure and Functions of brain	5 Hrs.
Unit-III	**Heart Physiology:** Cardiac Cycle and Cardiac Output; Control of Blood Pressure. **Physiology of the Circulation:** Physical Principles of Blood Flow; Short Term Regulation of Blood Pressure.	5 Hrs.

	Blood: Composition of blood- Blood types; White blood cells and Red blood cells. **Endocrine system function**: Endocrine system organs-Pituitary, Thyroid, Adrenal, Pancreas - Hormones- common diseases of endocrinal dysfunction	
Unit-IV	**Immunology:** The lymphatic system; Inflammation; Innate and Acquired immunity; Vaccines. **Respiratory System:** Mechanics of Breathing; Airway Resistance and Breathing; Transport of Oxygen and CO2 by Blood **Digestive System:** Regulation of Gastric Secretion; Role of the Small and Large Intestines in Digestion; Role of the Liver in Metabolism. **Urinary System:** General anatomy of the kidney; Glomerular Filtration; Tubular Re-absorption;	5 Hrs.
Unit-V	Medicinal and Aromatic Plants **Essential oils** and biochemistry of terpenes and other aromatic compounds **Chemistry of alkaloids** and pharmaceutical applications - Chemistry of polyphenols, their health properties including antioxidant activity **Plants as ancient and modern medicines** – malaria and quinine, digitalis steroids and the drug plants **Phyto bioactive compounds extraction methods** -From ancient to modern methods - Distillation- aqueous and organic solvent extraction methods	6 Hrs.

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Learning Objectives:

- Develop a thorough understanding of fundamental concepts in human physiology, interactions between major physiological systems, and the effects of selected pathological conditions on the function of these systems and their specific organs.
- Develop a solid knowledge of human anatomy including the understanding of the cause-effect relationship between structure and function of tissues, organs, and systems.
- Think critically about the importance and impact of physiology of the human body
- Demonstrate a high degree of maturity and professionalism expected of future health care professionals.

Course Outcome:

- On successful completion of the course, the students will have ability to attain below: Define and explain basic medical terminology as related to the anatomy and physiology. Understand, identify, and describe the various regions, sections, positions and directions of the body.
- Identify and describe the major body cavities and their subdivisions.
- Understand and describe the anatomy and physiology of the cell, tissues, skeletal, muscular, nervous system.
- Students would be understand the basic structural and functional elements of human body
- Students would have knowledge on Skeletal and muscular systems
- Students would be able to comprehend circulatory and nervous systems and their components

Students would study importance of digestive and urinary systems in Human body

E – Learning Links:

https://www.healthline.com/health/the-endocrine-system#hormones

https://www.britannica.com/science/human-endocrine-system

Reference Books:

1. Prabhjot Kaur. Text Book of Anatomy and Physiology. Lotus Publsihers. 2014
2. Elaine.N. Marieb , Essential of Human Anatomy and Physiology, Eight Edition, Pearson Education, New Delhi 2007
3. Valerie C. Scanlon and Tina Sanders, Essential of Human Anatomy and Physiology, Fifth Edition, F.A. Davis Company, Philadelphia 2007
1. Frederic H. Martini, Judi L. Nath, Edwin F. Bartholomew, Fundamentals of Anatomy and Physiology. Tenth Edition, Pearson Publishers, 2014
2. William F.Ganong, Review of Medical Physiology, 22nd Edition, Mc Graw Hill, New Delhi. 2005
3. Eldra Pearl Solomon, Introduction to Human Anatomy and Physiology, Third Edition, W.B. Saunders Company, 2008
4. Guyton and Hall, Medical Physiology, 13th Edition, Elsevier Saunders, 2015.

20VP104: Applied Chemistry - 2 Credits		
Unit-I	**Classification of Elements** Need for the Periodic Classification of Elements - the need of classification of elements - Mendéelev's periodic table - Achievements of Mendeléev's Periodic Table-Metallic and Non-metallic properties of elements	5 Hrs.
Unit-II	**Unit -II: Thermo Chemistry** Internal energy and Enthalpy-Exothermic and Endothermic reactions-Solutions and Colloids - electronegativity	5 Hrs.
Unit-III	*Basics of Organic Chemistry* Unique characteristics of carbon- Hydrocarbons-Functional group-IUPAC Nomenclature of Organic compounds	5 Hrs.
Unit-IV	Hydrocarbons: Saturated, unsaturated, aromatic hydrocarbons and a few examples for each type Aromatic Hydrocarbons: Aromatic compounds-Heterocyclic compounds Hetero Atomic Organic Compounds: Preparation methods and reactions of: 1. Ethyl chloride 2. Ethanol 3. Diethyl ether 4. Acetaldehyde 5. Acetone	6 Hrs.
Unit-V	Fundamentals of Biological Chemistry: Compounds play significant roles in our lives: Transition metal complexes, alcohols, phenols, proteins, carbohydrates, carboxylic acids, lipids, amino acids, enzymes, nucleic acids, and vitamins.	5 Hrs.

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Reference Books:

1. Text book of Inorganic Chemistry by Puri & Sharma
2. Text book of Organic Chemistry by Puri & Sharma
3. Text book of Organic Chemistry by Arun Bahl & B.S.Bahl

E – Learning Links:

1. https://www.khanacademy.org/science/chemistry/periodic-table
2. https://en.wikipedia.org/wiki/Hydrocarbon
3. http://apple.niu.edu.tw/ezfiles/0/1000/img/48/wang_chemistry_ch08.pdf
4. https://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
5. https://www.masterorganicchemistry.com/
6. https://ncert.nic.in/textbook/pdf/jesc105.pdf

Course Objectives:

1. The student will understand and describe the principles of classification of periodic chart of elements
2. Will describe the metallic and non-metallic properties of elements
3. The student will be conversant and describe the characteristics organic compounds and hydrocarbons
4. The student will understand and describe biologically important chemical compounds

Course Outcome:

On successful completion of the course, the students will have ability to attain below:

1. Explain Main Features of Modern Periodic Table, Classification of elements, Merits and demerits of modern periodic table
2. Explain Internal energy and Enthalpy, Law of conservation of energy, Exothermic and Endothermic reactions, Heat of Reaction and types of heats of reactions
3. Discuss the Classification of Organic compounds, IUPAC Nomenclature of Organic compounds, Different classes of Organic compounds
4. Discuss the Classification of Hydrocarbons, Preparation methods and Reactions of Methane, Ethylene and Acetylene
5. Aromatic Hydrocarbons, Explain Huckles rule, Arene and Poly nuclear aromatic compounds, Preparation methods and Reactions of benzene
6. Explain the various classes of hetero atomic organic compounds
7. Discuss the fundamentals of life molecules, compounds and their role in our lives.

Suggested Student Activities

1. Student visits Library to refer the Text books, reference books and manuals to find their specifications
2. Identify and explain various natural processes, exothermic and endothermic reactions in our daily life.
3. Quiz on IUPAC nomenclature of organic compounds.
4. Prepare chart of classification of Organic compounds
5. Prepare chart of classification of Hydrocarbons
6. Make chart showing preparation and reactions of methane, ethylene and acetylene
7. Write resonance structures of benzene and other aromatic compounds
8. Make chart showing preparation and reactions of various organic compounds
   Step-1: Data/ literature collection.

   Step-2: Summarization of data/ literature collected.

Step-3: Explain the process and compare them with the help of power point presentation/ Chart preparation

Step-4: Submit the report.

20VP105: English - Spoken - 5 Credits		
Unit-I	Introduction to Communication, Definition, Nature and Scope Communication Types and categories of Communication, Role of culture in communicati Cross – cultural communication skills, Corporate skills, Occupation speci Communication Skills, Barriers to communication, Importance and Purp of Communication • Process of Communication, Listening Skills Purpose of Listening Listening to Conversation (Formal and Informal) Active Listening- an Effective Listening Skill Benefits of Effective Listening Barriers to Listening	15Hrs.
Unit-II	Meaning of non-verbal skills, Types and non-verbal skills, Personality Development, English Language skills, work specific skills, Efficiency an effectiveness in spoken language. Vocabulary and behavior, Importance o non-verbal communication in spoken language. Non-Verbal Communicati - Personal Appearance □ Gestures Postures Facial Expression Eye Contacts Body Language (Kinesics) Time language Silence Tips for Improving Non-Verbal Communication	15 Hrs.
Unit-III	**Business Communication** Definition, Agenda, types of meetings, Tools and methods to conduct seminar, conferences, meetings, barriers technical communication, Personal, Social and Business Barriers, Overcoming barriers	15 Hrs.
Unit-IV	**Nature of Pharmaceutical Companies and Scope for Communication** Introduction to the objectives of Pharmacy companies Communication with clients and customers Jargons of the Pharmacy world, Role of Public Relations in Pharmaceuticals Company, Attributes of PR practitioner, Code of conduct for PR professionals.	15 Hrs.
Unit-V	Communication for CSR activities in Pharmaceutical Company Advertisements, MMS, video conferencing, reporting Hands on activities	5 Hrs.

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For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.

Reference Books:

1. Vikas (Life skills Manual) : Published by: Member Secretary & Executive Director, Karnataka JnanaAayoga (Karnataka Knowledge Commission) Govt of Karnataka, Copy Right:2010 Karnataka JnanaAayoga

2. ManikGhos, ''Positivity – A way of Life'', Published by Orient BlackswanPvt Ltd 3. Swami Vivekananda, ''Personality Development'', published by Ramakrishna Math and Ramakrishna Mission (December 2011)

3. Philip Lesly,2000, Handbook of Public Relations and Communication, JBS Publishers, New Delhi
4. Meenakshi Raman & Prakash Singh : Business communication, Oxford University Press
5. Asha Kaul : Business Communication, New Delhi Prentice Hall
6. Wren & Martin – English Grammar Book

E – Learning Links:

1. http://youtu.be/3Tu1jN65slw
2. http://youtu.be/lwWi_SfDpzg
3. http://youtu.be/sYBw9-8eCuM
4. http://youtu.be/etll6J5MG0w

Course Objectives:

1. To make the students fluent in spoken language (English) and converse with confidence with the target audience.
2. To make the understanding of intra and inter personal qualities needed for communication
3. To make them understand the importance of verbal and non-verbal aspects for effective communication
4. To overall groom the personality and communication skills.

Course Outcome:

On successful completion of the course, the students will have ability to

1. Communicate fluently with clarity
2. Adopt and adapt to situations and communicate
3. Follow a pattern/order in communication (introduction, content, pros & cons and conclude appropriately)
4. Use jargons and communicate technically to their community
5. Structure their speech/content to reach out to the target group.

Suggested Student Activities

1. Visiting library, Read magazines and books with illustrations to improve conversation
2. Group Discussions.
3. Quiz for vocabulary enhancement.
4. Questionnaire for field work
5. Podium talks
6. Reading aloud, reading diagrams/pictures

20VP201 : Engineering Drawing - 1 Credit		
Note: • First angle projection to be followed • Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students.		
Unit-I	**Introduction**: Fundamentals,Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning, line conventions,scaling, symbols, fits & tolerances	2 Hrs.
Unit-II	Theory of Projections:Types of projections, sketching practice of pictorial view from objects, exercise on missing surfaces and views, Identification of surfaces on drawn views & object drawn.	3 Hrs.
Unit-III	**Geometric construction & Curves:**Drawing of parallel &, perpendicular lines, Construction of polygons & solid objects – Cube, Cone, Prism, Pyramid, Frustum of Cone with dimensions, Methods of line segment&bisecting, Engineering Curves-Ellipse, parabola, hyperbola **Projection of Points:** Projections of points located in same quadrant and different quadrants	3 Hrs.
Unit-IV	**Projection of Lines:** Projection of straight lines inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method.	3 Hrs.
Unit-V	**Projectionofplanes:**Projectionofplanesinclinedtoboth the principal planes by change of positionmethod.	4 Hrs.
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Text Book(s)

1. Gopalakrishna, K. R. (2005) Engineering Graphics, 32nd edition, Subash Publishers Bangalore, India
2. Surjit Singh (2014), A text book of engineering drawing, Dhanpat Rai & Co, India

Reference(s)

1. Basant Agarwal and Agarwal C.M., (2008), Engineering Drawing, Tata McGraw Hill Publishing Company Limited, NewDelhi.
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House, Gujarat, India

Objectives:

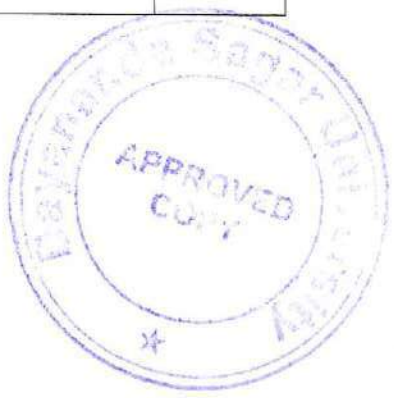
- To create awareness and emphasize the need for Engineeringdrawing
- To follow basic drawing standards andconventions
- To understand the principles of geometrical objects, curves and constructmanually
- To understand the concepts of orthographic projections
- To construct orthographic projection of points, lines and planes

Course Outcomes:

After undergoing this course students will be able to:

- Explain usage of instruments, dimensioning & tolerances, conventions and standards related to workingdrawings
- Construct points, lines and planes using orthographic projections principles
- Read and apply engineering drawing for different application in the field of work.

20VP202 :Occupational Health & Safety - 4 Credits		
Unit-I	**Principles of Industrial Hygiene:** Introduction - Introduction to Industrial Hygiene - Standards and Guidelines and Ethical Code of Conduct - Industrial Hygiene Concepts - Work environment - Objectives of Occupational Hygiene - Levels of contaminants TLVs and its types - (ACGIH) -BEIs **Recognition of Health Hazards:** Potential health hazards, air contaminants - Physical Hazard at Workplaces: Thermal Stress Chemical Hazards at Workplaces: Biological Hazards Workplaces ErgonomicHazards Workplaces	15 Hrs.
Unit-II	**Evaluation:** Basic Toxicology Exposure Assessment Concepts Air Sampling for Particulate Matter Air Sampling for Gases and Vapors Microbial Sampling **Control:** Hierarchy of Controls Principles of Ventilation Personal Protective Equipment and Other Control Options	15 Hrs.
Unit-III	**Occupational Diseases:** Characteristics of occupational and other work related diseases - Concepts in Occupational Health - **Physical Hazards at workplace** - Thermal Stress - Cold Stress - Vibrations - Radiation **Chemical Hazards:** Gases - Vapors - Metals - Organic Solvents, Dust - Silicosis - Asbestosis, Pesticides - Occupational Infections - Occupational Dermatitis - Reproductive Effects - Behavioural Psychosomatic Disorders - Cardiac Health Disease - CNS Effects - Functions of an Occupational Health Service	15 Hrs.



Unit-IV	Occupational Safety: Occupational safety and accident prevention, Basic concepts and definitions - Occupational accidents - Causes of accidents and injuries - Prevention and control of occupational accidents - Basic First Aid Practices	15 Hrs.
Unit-V	**Occupational Ergonomics: A multidiscipline science - common causes of work accidents caused by human errors** - Ergonomic Hazards, Ergonomic Guidelines, Ergonomic injuries and their classification - Reporting (proactive and early), Ergonomic Risk Factors - Use of anthropometric data Indian Factories Act - Hazardous Processes - Permissible - Health, Safety and Welfare Provisions	15 Hrs.

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For example: the skill based components that are assignments, field visit learning, self study, lab practice and the like are integrated with theoretical inputs

Gist of the Course

Occupational safety and health is a discipline with a broad scope involving three major fields – Occupational Safety, Occupational Health and Industrial Hygiene.

- **Occupational safety** deals with understanding the causes of accidents at work. Ways to prevent unsafe act and unsafe conditions in any workplace. Safety at work discusses concepts on good housekeeping, proper materials handling and storage, machine safety, electrical safety, fire prevention and control, safety inspection, and accident investigation.

- **Occupational health** is a broad concept which explains how the different hazards. Risks at work may cause an illness and emphasizes that health programs are essential in controlling work-related and/or occupational diseases. Industrial hygiene discusses the identification, evaluation, and control of

- **Industrial Hygiene** is a discipline dealing with the study of physical, chemical, biological and ergonomic hazards.

Reference Books:

Web Links

1. Occupational Health and Safety Books PDF (Updated SEP 2020) (free-safety-training.com) https://www.free-safety-training.com/product/occupational-health-and-safety-books-pdf/
2. Principles of Industrial Hygiene : Lecture Materials (jhsph.edu)http://ocw.jhsph.edu/index.cfm/go/viewCourse/course/PrinciplesIndustrialHygiene/coursePage/lectureNotes/
3. http://www.oshc.dole.gov.ph/images/OSHTrainingAnnouncement/BOSH-Manual_Narrative-Handout.pdf

Course Objectives:

The Occupational Health and Safety Course has the following objectives in deliberating, discussing and understanding the principles and practice:

- To maintain the health and safety of employees in a manufacturing facility
- To prevent the unfavorable effects on health caused by working conditions
- To become familiar to occupational environment of needs of workers.
- To consider the issues relating to industrial safety, occupational medicine, industrial hygiene, training & education.
- To be conversant with regulations and laws under Indian Factories Act

Course Outcome: At the end of the course students will be able to:

- Interpret and apply work environment contaminant standards, legislative requirements and best practices in a variety of workplaces.
- Apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and psychosocial hazards.
- Collect, manage, and interpret information and data to identify trends and issues in the workplace.
- Discuss the implications of exposures, thermal stress, cold stress, chemical, biological hazards at workplaces.
- Design, support, and evaluate health and safety programs and implement procedures using project management principles and processes appropriate to the task.

20VP203	Pharma Manufacturing Operations - 4 Credits	
Unit-I	**DosageForms** Definition, need for dosage forms, classification of dosage forms. Definition and introduction- Tablets, capsules, powders, granules, snuffs, dentifrice, insufflations, dusting powder, emulsion, suspension, syrups, solutions, liniments, lotions, elixirs, linctus, ointments, pastes, creams and suppositories.	10Hrs.
Unit-II	**Pharmaceutical calculation** Introduction, weight and measures, measurement systems- Imperial system, Metric system, Avoirdupois system, Apothecaries system. Calculations involving percentage solutions, proof spirit and isotonic solutions.	10 Hrs.
Unit-III	**Size reduction and Separation** **Size reduction-** Definition, objectives, mechanisms, factors affecting size reduction. Hammer mill, cutter mill and ball mill. **Size separation-** Definition, objectives, mechanisms and applications of size separation. Sieve shaker and cyclone separator.	15 Hrs.
Unit-IV	**Mixing** Definition, factors affecting mixing, applications, mechanisms of mixing. Planetary mixer and Double cone blender	10 Hrs.
Unit-V	**Drying and Evaporation** **Drying-** Definition, objectives, mechanisms, applications and rate of drying curve. Tray dryer, spray dryer and fluidized bed dryer. **Evaporation-** Definition, objectives, factors influencing evaporation and applications. Horizontal tube evaporator and multiple effect evaporator.	15 Hrs.

Notes:

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For example: the skill based components that are assignments, field visit learning, self study, lab practice and the like are integrated with theoretical inputs

Reference Books

1. Ansel's Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.

2. Lachman/Lieberman's Theory and Practice of Industrial Pharmacy, CBS Publishers & Distributors Pvt Ltd.

3. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.

4. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.

5. C.V.S. Subrahmanyam, J. ThimmaSetty, Sarasija Suresh, V. Kusum Devi. Pharmaceutical Engineering (Principles and Practice). Vallabh Prakashan, Delhi.

Course Objective

1. Introduction to various pharmaceutical dosage forms.
2. To study the various pharma operations involved in the manufacturing of dosage forms.

Course Outcome

1. The students will be able to have an understanding about operations of the pharmaceutical industry.
2. The students will have an overview of basic skills involved in pharmaceutical operations.
3. The students will have knowledge on various pharmaceuticaldosage forms.

Suggested Student Activities

1. Visit library to refer the text books, reference books and manuals.
2. Explain various pharmaceutical operations, their mechanisms, advantages and disadvantages.
3. Quiz on various pharmaceutical operations.
4. Quiz on various pharmaceutical dosage forms.
5. Prepare chart of classification of various dosage forms.

20VP204 : Pharmaceutical Chemistry - 3 Credits		
Unit-I	Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate. To Carry out limit tests for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals.	9 Hrs.
Unit-II	Study of Monograph analysis of Bentonite, Dried Aluminium Hydroxide Gel, Calcium gluconate, Magnesium Hydroxide, Ferrous sulphate, Sodium carbonate and copper sulphate. To Carry out Identification tests for the above compounds.	6 Hrs.
Unit-III	Methods of expressing concentration like Molarity and Normality. Primary and secondary standards. Preparation and standardization of various solutions Like Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, Sodium Carbonate, potassium permanganate and Cerric ammonium Sulphate.	10 Hrs.
Unit-IV	Acid base Titrations and complexometric titrations: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves. To carry out assay of Ammonium chloride by acid base Titration. Assay of calcium gluconate by Complexometric titration.	10 Hrs.
Unit-V	Non aqueous titration and redox Titrations. Principles and techniques. To carry out titration of Copper sulphate by Iodometry, Hydrogen peroxide by Permanganometry and estimation of Sodium Benzoate by Non Aqueous Titration.	10 Hrs.

Notes:

BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be and theory portion are integrated in each course.

For example: the skill based components that are assignments, field visit learning, self study, lab practice and the like are integrated with theoretical inputs

Reference Books:

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone, Press of University of London.

2. A.I. Vogel, Text Book of Quantitative Inorganic analysis

3. Bentley and Driver's Textbook of Pharmaceutical Chemistry.

4. Indian Pharmacopoeia.

5. M.L Schroff, Inorganic Pharmaceutical Chemistry

Course Objectives:

(1) To know the sources of impurities and methods to determine the impurities in Pharmaceuticals.

(2) To understand the monograph analysis of some Pharmaceutical compounds as per Indian Pharmacopoeia.

(3) To understand the principles of Volumetric analysis like acid base titration, Non aqueous titrations and Redox Titrations.

Course Outcome:

(1) Upon completion of the course the student shall be able to understand the types of impurities in Pharmaceuticals and shall be able to carry out limit tests for impurities as per requirements of Indian Pharmacopoeia.

(2) The student will be able to learn the Information for a drug (or class of related drugs) such as the kinds and amounts of ingredients it may contain, the conditions and limitations for which it may be offered, directions for use, warnings, and other information that its labeling must contain and will be able to perform the identification tests of some pharmaceutical compounds.

(3) The student shall be able to learn methods of expressing concentrations, preparation of tandard solutions and techniques of acid base, Non Aqueous titrations, Redox Titrations and Complexometric titrations.

Suggested Student Activities

1. Student visits Library to refer the Text books, reference books and manuals.
2. Quiz on expression of concentrations
3. Prepare chart of classification of Organic compounds
4. Prepare chart of Monograph analysis of I.P Compounds.
5. Make charts about different titrimetric methods.

20VP205	English –Written - 3 Credits	
Unit-I	Introduction to pictorial and script writing, Difference between Personal and Business Communication Communication Network in an Organization Internal and External Communication Horizontal & Vertical(Downward/Upward) Communication Age of Globalization and the Need for Communicating in English	5 Hrs.
Unit-II	**Verbal communication (written)** Effective Writing Skills – Remedial English Grammar Types of Sentences Main Forms of Written Communication Paragraph Writing (Linkage and Cohesion) Understanding and Applying Vocabulary	10 Hrs.
Unit-III	**Communication for Career Building** Applying for a job , Preparing Cover letters , Preparing a CV/Resume and Effective Profile writing Presentation Skills, Preparing a PowerPoint Presentation, Greeting and introducing , Presenting a Paper	10 Hrs.
Unit-IV	**Business Communication** Importance of written documents, different formats of letter writing, (formal) Email, Letters, Proposals, Contracts. Preparing Agenda and Minutes for Meetings Writing Notices and Memos, Drafting an E-mail, Press Release Correspondence with Govt./Authorities, Office Orders, Enquiries and Replies)	10 Hrs.
Unit-V	**Technical Writing** Introduction, Definition, Skill sets for Technical Writing, Process and steps to technical writing, Best practices in technical writing..	10 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input		

shall have to be assigned to students. In general, skill portion be and theory portion are integrated in each course.

For example: the skill based components that are assignments, field visit learning, self study, lab practice and the like are integrated with theoretical inputs

Reference Books:

1. Vikas (Life skills Manual) : Published by: Member Secretary & Executive Director, Karnataka JnanaAayoga (Karnataka Knowledge Commission) Government of Karnataka, Copy Right:2010 Karnataka JnanaAayoga

2. ManikGhos, ''Positivity – A way of Life'', Published by Orient BlackswanPvt Ltd 3. Swami Vivekananda, ''Personality Development'', published by Ramakrishna Math and Ramakrishna Mission (December 2011)

3. Philip Lesly, 2000, Handbook of Public Relations and Communication, JBS Publishers, New Delhi
4. Meenakshi Raman & Prakash Singh: Business communication, Oxford University Press
5. Asha Kaul : Business Communication, New Delhi Prentice Hall

E – Learning Links:

1. http://youtu.be/kCzUVVKX1E8
2. http://youtu.be/7ptiYPcleM8
3. http://youtu.be/biocrCx5T_k

Course Objectives:

1. To make the students fluent in written language (English) and write emails and letters with clarity.
2. To enable students to make notes and report
3. To make them understand the importance of written documents that is used as future reference
4. To prepare speeches and write for Public Relations activities

Course Outcome:

On successful completion of the course, the students will have ability to

1. Communicate fluently with clarity
2. Follow email etiquettes
3. Follow a pattern/order/format of report, content, letter and email writing
4. Use jargon words suitably

5. Follow structure in writing - Introduction, subject matter, conclude appropriately.

Suggested Student Activities

1. Visiting library, Read magazines and books with illustrations to know to respond
2. Telephonic note taking and note leaving
3. Wall magazines and charts to represent concepts
4. Field work to collect data / conceptual data collection and completing a structured minor project
5. Writing flow charts -

THIRD SEMESTER SYLLABUS: B VOC

May 2022 to Sept 2022

20VP301	**Engineering Design**	**1 Credit - 13 hours**
Unit-I	Introduction: Fundamentals, Drawing standard - dimensioning, Lines, Introduction to orthographic & perspective projection. Construction of rectangles, circles, arc, ellipse and parabola	3 Hrs.
Unit-II	Construction of Tangent and Normal at any point on these curves, spline, use of constraints and sketch detailing and editing	2 Hrs.
Unit-III	Construction of Solids: Prisms, pyramids, cone, cylinder using extrude and revolve operations	3 Hrs.
Unit-IV	Construction of complex solid structures using loft, rib and web operations, creation of multiple planes	3 Hrs.
Unit-V	Assembly of parts, creation of sections, animations of the models and demonstration of 3d printing	2 Hrs.

Course Objectives:

- Introduce students to a discipline of design
- Create hand sketches & generate designs
- Understand the significance of Team Work and roles of individuals within a team.
- To understand the principles of geometrical curves and construct manually
- To learn using professional software for construction of geometry
- To develop the lateral surfaces of solids
- To create simple engineering 3D components and assembly

Course Outcomes:

- To build 3D part model using Autodesk Fusion 360
- Apply the design thinking principles and recognize the significance of innovation
- Identify usage of instruments, dimensioning & tolerances, conventions and standards related to working drawings
- Construct geometries of planes and solids
- Develop section of solids for different planes of inclination
- Create associative models at the component and assembly levels for product design
- Develop many creative ideas through design criteria & brainstorming sessions

2.5 Text Book References

1. C. L. Dym and Patrick Little, Engineering Design- A Project Based Introduction, John Wiley, 1995.
2. Gopalakrishna, K. R. and Sudheer Gopala Krishna (2015). "Computer Aided Engineering Drawing", Subash Publishers, Bangalore, India.
3.

References

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (Harper Business, 2009)
2. Dhananjay A.J, (2018). "Engineering Drawing with Introduction to AutoCAD", Tata McGraw-Hill Publishing Company Ltd.

20VP302: **Pharmaceutics-I**		**4 Credits: 52 Hrs.**
Unit-I	**History of Pharmaceutics:** Events leading to the formation of pharmaceutical society of Great Britain **Development of profession of pharmacy:** Pharmaceutical industry in India	8 Hrs.
Unit-II	**Origin & Development of the pharmacopoeia** – IP/BP/USP **Dosage forms:** Introduction to dosage form & routes of administration	12 Hrs.
Unit-III	**Dosage form design:** Biopharmaceutical consideration **Alternate system of medicine**: Introduction to Ayurvedic & Homeopathic formulations.	12 Hrs.
Unit-IV	**GALENICALS:** Introduction, size reduction, **General properties of drug constituents** – **Solvents** used in extraction of drugs, **Processes** used for extraction (infusion, decoction, maceration, & modifications, percolation, hot extraction & modifications).	12 Hrs.
Unit-V	**Equipment** used for large scale extractions. Study of official extracts	8 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course. For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.		

Course Objectives: This course will discuss the following aspects of pharmaceutical dosage forms
1. to understand the history of pharmaceutics and development of systematic pharmacopeia
2. To understand dosage and design of formulations
3. To get exposed to equipment of large scale manufacture and extractions with processes

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe biopharmaceuticals and discuss pharmacopeias
2. Explain different solvents commonly utilized in pharmaceutical manufacture
3. Discuss about processes involved in extractions on a large scale using solvents
4. Have proficiency on Pharmaceutical Formulations

References:

1 Howard C. Ansel, Nicholas G. Popovich, Lord V. Alien, Pharmaceutical Dosage Form And Drug Delivery Systems 6th , 1995 B.I.Waverly Pvt.Ltd.,New Delhi
2 David B.Troy, Remington-The Science And Practice Of Pharmacy (Vol.1& 2) 21st, 2006 Lippincott Williams & Wilkins
3 J.W. Cooper, Colin Gunn, Tutorial Pharmacy 4th, 1950 Sir Isaac Pitman & Sons Ltd., London
4 Michael E. Aulton, Pharmaceutics: The Science Of Dosage Form Design 1998 Churchill-Livingstone

20VP303: **Biochemistry and Clinical Pathology**		**3 Credits; 39 Hrs.**
Unit-I	**Introduction to biochemistry** **Proteins –** Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.	10 Hrs.
Unit-II	**Carbohydrates –** Brief chemistry and role of Carbohydrates, Classification, qualitative tests, Diseases related to carbohydrate metabolism. **Lipids –** Brief chemistry and role of Lipids, Classification, qualitative tests. Diseases related to lipids metabolism	10 Hrs.
Unit-III	**Vitamins and Coenzymes –** Brief chemistry and role of Vitamins and Coenzymes. **Minerals –** Role of minerals and water in life processes.	8Hrs.
Unit-IV	**Enzymes –** Brief concept of enzymic action, Factors affecting it. Therapeutic and pharmaceutical importance.	5 Hrs.
Unit-V	**Metabolism –** Brief concept of normal and abnormal metabolism of proteins, carbohydrates and lipids.	6 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course. For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.		

Course Objectives:

- To gain the understanding of the molecular levels of the chemical process associated with living cells.
- To provide biochemical facts and the principles to understand the metabolism of nutrient molecules in physiological and pathological conditions.
- To understand abnormal metabolism of proteins, carbohydrates and fats

Course Outcomes:

- Understand the significance of Biochemistry and describe the chemistry of carbohydrates, lipids, proteins, and amino acids
- Discuss the enzymes, their importance in the design of new drugs, therapeutic applications.
- Explain the importance of minerals and role of water in biological processes.
- Explain metabolism of nutrient molecules and apply knowledge and skills associated with clinical pathology

Text Books:

- M. R. Chaudhari, Y. A. Kulkarni, S. B. Gokhale, Pragati Books Pvt., Ltd., 2008 Biochemistry and Clinical Pathology
- Rahul Lovhare. Rageeb Md. Usman, Sunil P Pawar, Textbook of Biochemistry and Clinical Pathology, 9781543343496
- Milind J. Umekar , N. R. Kotagale , R. T. Lohiya, A Text Book Of Biochemistry & Clinical Pathology, Career Publication, ISBN13: 9788188739349

20VP304: **Community Pharmacy**	**39 Hours 3 Credits**

Unit-I	**Concept of health –** Definition of physical health, mental health, social health, spiritual health determinants of health, indicators of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.	5 Hrs.
Unit-II	**Nutrition and health –** Classification of foods requirements, disease induced due to deficiency of proteins, Vitamins and minerals-treatment and prevention.	6 Hrs.
Unit-III	**Environment and health –** Water borne diseases control-medical entomology, arthropod borne diseases and their control, rodents, animals and diseases. **Fundamental principles of microbiology** – classification of microbes, isolation, and staining techniques of organisms of common diseases.	8 Hrs.
Unit-IV	**Communicable diseases –** Causative agents, modes of transmission and prevention. **a) Respiratory infections –** Chicken pox, measles. Influenza, diphtheria, whooping cough and tuberculosis. **b) Intestinal infections –** Poliomyelitis. Hepatitis. Cholera. Typhoid, Food poisoning, Hookworm infection. **c) Arthropod borne infections –** plague, Malaria, Filariasis. **d) Surface infections –** Rabies, Trachoma, Tetanus, Leprosy. **e) Sexually transmitted diseases –** Syphilis. Gonorrhoea. AIDS.	10 Hrs.
Unit-V	**Non-communicable diseases –** Causative agents, prevention, care and control; Cancer, Diabetes, Blindness, Cardiovascular diseases. **Epidemiology –** Its scope, methods, uses, and dynamics of disease transmission, immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection, disinfection procedures, for faeces, urine, sputum, room linen, dead-bodies, instruments	10 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course. For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill-based components that are assignments, field visit learning, self-study and the like.		

Course Objectives:

- To understand meaning of wellbeing physically, mentally, socially and spiritually
- To learn the importance of environmental health and nutrition
- To learn about various communicable diseases, the vectors and their transmission
- To lean the principles of epidemiology and non-communicable diseases

Course Outcomes:

- Discuss indicators of health, concept of disease, natural history of diseases, the disease agents
- Able to Classify nutrients, diseases due to deficiency of proteins, vitamins and minerals-
- Describe Water borne, diseases caused by rodents and animals and their control
- Demonstrate communicable and non-communicable diseases and discuss epidemiology of a disease

Text Books:

- Jon Waterfield, Community Pharmacy Handbook, Pharmaceutical Press 2008, ISBN 0853697167
- Paul Rutter, Community Pharmacy, Pub.: Elsevier Health Services, 2011, ISBN: 9780729580793

20VP305: **Technical Communication**		**3 Credits; 39Hours**
Unit-I	**Basics of Technical Communication:** Importance of Technical Communication; Objectives and Characteristics of Technical Communication; Communication Cycle; Levels of Communication	7 Hrs.
Unit-II	**Listening Skills:** Meaning and art of listening; listening and empathy in communication; Why don't we listen (reasons for poor listening); Poor listening habits; Qualities of a good listener; Active versus passive listening; Barriers for effective listening; tips for effective listening	8 Hrs.
Unit-III	**Reading:** Purpose of reading; Intensive, extensive and critical reading **Effective Speaking:** Confidence, clarity and fluency; Rate, volume, pitch , pause; Barriers to speaking; Public speaking	8 Hrs.
Unit-IV	**Effective Presentation Strategies:** Planning, Tips for creating an impact on audience; Modes of delivery: Extemporaneous; Impromptu; Controlling nervousness and stage fright; Effective slides preparation skills	8 Hrs.
Unit-V	**Technical Writing:** Importance, characteristics; Audience recognition and analysis; Techniques for good technical writing	8 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course. For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.		

Course Objectives:

- To know the importance and basics of technical communication
- To learn reading and practice effective speaking
- To understand effective presentations and prepare presentations
- To familiarize with techniques of good technical writing

Course Outcomes:

- Demonstrate basic technical communication skills
- Prepare and present to different audiences
- Able to write effectively and perform in written and oral communication

Text Books

- Meenakshi Raman, Sangeeta Sharma, Technical Communication- Principles and Practice, 3rd Ed. Oxford University Press, 2015
- Steve Mandel, Effective Presentation Skills, 2000, Course Learning Thomson Learning

FOURTH SEMESTER SYLLABUS: B VOC

JULY 2022 to DECEMBER, 2022

20VP401**: Nutraceuticals and Herbal Drugs**		**1 Credit: 13 Hrs.**
Unit-I	**Nutraceuticals:** General aspects, Market, growth, scope and types of products available in the market.	2 Hrs.
Unit-II	**Health benefits and role of Nutraceuticals** in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.	2 Hrs.
Unit-III	**Study of herbs as health food:** Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina	3 Hrs.
Unit-IV	**Herbal drugs industry:** Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India **Herbal Drugs & Cosmetics**: Ginseng, Garlic, Pepper & Ephedra. Fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.	3Hrs.
Unit-V	**Herbal formulations** : Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes	3 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course. For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.		

Objectives:

- To understand the significance of nutraceuticals and health benefits
- To understand raw material as source of herbal drugs, herbal drug product
- To know the herbal cosmetics, natural sweeteners, nutraceuticals
- To have knowledge on herbal formulations

Outcomes:

- Describe latest nutraceuticals available in markets, their role in health and beneficial effects
- Explain very common herbs that are medicinal in nature and such herbs serve as foods
- Describe industrial herbal drugs including their formulations
- Explain some herbal cosmetics of industrial importance

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.

2. Textbook of Pharmacognosy by Tyler, Brady & Robber.

3. Pharmacognosy by Kokate, Purohit and Gokhale

4. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002

20VP402**: Pharmaceutics II**		**4 Credits: 52 Hrs.**
Unit-I	**Dispensed medications:** **Powders -** Types of powders-Advantages and disadvantages of powders, Granules, Cachets and Tablet triturates. Preparation of different types of powders encountered in prescriptions. Weighing methods, possible errors in weighing.	5 Hrs.
Unit-II	**Liquid Oral Dosage Forms:** **Monophasic Liquid Dosage Forms: C**ommonly used vehicles, essential adjuvant like stabilizers, colourants and flavours, with examples. Syrups, Mouth washes, Elixirs, Ear Drops, Nasal drops **Biphasic Liquid Dosage Forms:** **Suspension** (elementary study) - Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvants used like thickening agents, wetting agents, **Emulsions** - Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agents. Preservation of emulsions.	10 Hrs.
Unit-III	**Semi-Solid Dosage Forms:** **Ointments -** Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes: (i) Trituration (ii) Fusion (iii) Chemical reaction (iv) Emulsification. **Pastes -** Difference between ointments and pastes, bases of pastes. Preparation of pastes and their preservation. **Jellies -** An introduction to the different types of jellies and their preparation. **Suppositories and pessaries -** Their relative merits and demerits, types of suppositories, Preparation and packing of suppositories. Use of suppositories for drug absorption.	10 Hrs.
Unit-IV	**Sterile Dosage Forms:** **Parenteral dosage forms -** Definitions, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvants, processing, personnel, facilities and Quality control. Preparation of Intravenous fluids **Sterility testing -** Particulate matter monitoring-Faulty seal packaging.	8 Hrs.
Unit-V	**Ophthalmic Products -** Study of essential characteristics of different ophthalmic preparations. Formulation additives, special precautions in handling and storage of ophthalmic products.	6 Hrs.

Notes:
BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course.
For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.

Course Objectives: This course will discuss the following aspects of pharmaceutical dosage forms
1. To get exposed to basic concepts, types and need
2. To understand advantages and disadvantages, methods of preparation / formulation
3. To get knowledge on packaging and labelling requirements
4. To know about basic quality control tests, concepts of quality assurance and good manufacturing practices

Course Outcomes: Upon successful completion of this course, the students will be able to
1. Describe about the different dosage forms and their formulation aspects
2. Explain the advantages, disadvantages and quality control tests of different dosage forms
3. Discuss the importance quality assurance & good manufacturing practices

Books recommended: (Latest editions)
1. R. M. Mehta, Vallabh Prakashan, Text book of Pharmaceutics – II
2. Gaud and Gupta, Nirali Prakashan, Pharmaceutics –II
3. R. M. Mehta, Vallabh Prakashan, Dispensing Pharmacy
4. R.S.Gaud, A.V.Yadav, S.B.Gokhle & P.G. Yeole, Nirali Prakashan, A Text Book Of Pharmaceutics
5. P.V. Kasture, S.R. Parakh, S.B. Gokhale, A.R. Paradkar, Nirali Prakashan, A Text Book of Pharmaceutics.

20VP403**: Basics of manufacturing and pilot plant scale up 4 Credits -52Hours**		
Unit-I	**General principles of pharmaceutical product manufacturing plant facility** **Biotechnology products** Biotechnology product characteristics Biotechnology product manufacturing	10 Hrs.
Unit-II	**Pilot plant scale up** Pilot plant design and operation General principles Pilot plant scale up for tablet dosage forms	12 Hrs.
Unit-III	**Pilot plant scale up** Pilot plant scale up for oral liquids Pilot plant scale up for semi solids preparations	10 Hrs.
Unit-IV	**Pilot plant scale up** Pilot plant scale up for parentarals Pilot plant scale up for biotechnology products	10 Hrs.
Unit-V	**Scaling up to large scale manufacturing** What is a batch and what are the elements of large scale up Creation of MTD and BMR Principles of flexible manufacturing	10 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course. For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.		

Course Objectives:

- General principles of pharmaceutical manufacturing
- Understanding biotechnology products
- Pilot plant and scaling up for solids tablets, liquid orals, sterile formulations and semisolids

Course Outcome:

On successful completion of the course, the students will have ability to attain below:

- Define key terms for cGMP; Demonstrate knowledge of Good Manufacturing Practices and its perspectives
- Demonstrate knowledge of Good Manufacturing Practice in global contexts.
- Understanding of GMP regulations of EU, FDA and WHO
- Knowledge of International Conference of Harmonization
- Recognize the role of the FDA
- Describe the different types of inspections and explain the Quality System

Suggested Student Activities

1. Give a real life example of scale up from lab to pilot to large scale: oral tablet.
2. Give a real life example of scale up from lab to pilot to large scale: oral liquid.

3. Give a real life example of scale up from lab to pilot to large scale: semisolid or parenteral.

Reference Books:

1. Bentleys Textbook of Pharmaceuticals
2. Shayne Cox Gad PH.D., D.A.B.T., Pharmaceutical Manufacturing Handbook: Production and Processes; Editor(s) First published:28 August 2007; Print ISBN:9780470259580 |Online ISBN:9780470259818 |DOI:10.1002/9780470259818; Copyright © 2008 John Wiley & Sons, Inc.
3. Mehdi Nafissi, John A. Ragan, Keith M. DeVries, From Bench to Pilot Plant: Process Research in the Pharmaceutical Industry, American Chemical Society, 2002 - Medical - 151 pages

20VP404: **FORMULATIVE PHARMACY-**	**4 Credits - 52 Hours**	
Unit-I	**Preformulation Studies:** Goals and objectives, study of physicochemical characteristics of drug substances. **a. Physical properties:** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism **b. Chemical Properties:** Hydrolysis, oxidation, reduction, polymerization BCS classification of drugs	10 Hrs.
Unit-II	**Tablets:** Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems; Equipments and tablet tooling. **Tablet coating:** Types of coating, coating materials, formulation of coating composition, methods of coating, equipment	10 Hrs.
Unit-III	**Capsules: Hard gelatin capsules:** size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules. In process and final product quality control tests for capsules. **Soft gelatin capsules:** Nature of shell and capsule content, size of capsules, Packing, storage and stability testing of soft gelatin capsules **Pellets**: Introduction, formulation requirements, palletization process, equipment for manufacture of pellets	10 Hrs.
Unit-IV	**Parenteral Products**: Definition, types, advantages and limitations. Production procedure, production facilities and controls **Formulation of injections**, sterile powders, emulsions, suspensions, large volume parenteral and lyophilized products, Sterilization. **Containers and closures selection**, filling and sealing of ampoules, vials and infusion fluids.	10 Hrs.
Unit-V	**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens. **Pharmaceutical Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.	10 Hrs.

Notes:
BVoC - PMT program is skill-intensive program. Although credits are specified for each course, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course.
For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill-based components that are assignments, field visit learning, self-study and the like.

Objectives:

1. To Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. To Know various considerations in development of pharmaceutical dosage forms
3. To Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Outcomes: After successful completion of the course student will be able to:

- Describe tablets, their classification types and explain the ideal characteristics of tablets
- Explain Capsules made from hard and soft and final product quality control tests for capsules.
- Define and describe parenteral product types, formulation of injections, and containers and closures selection of ampoules, vials and infusion fluids.
- Demonstrate materials that are used for packaging pharma products including their essential requirements; Describe cosmetics, their formulative preparations

Books Recommended

Recommended Books: (Latest Editions)

1. by H.A. Liberman, Leon Lachman & J.B.Schwartz, Pharmaceutical dosage forms - Tablets, volume 1 -3
2. Liberman & Lachman, Pharmaceutical dosage form - Parenteral medication vol- 1&2
3. Liberman & Lachman, Pharmaceutical dosage form disperse system VOL-1
4. Gilbert S. Banker & C.T. Rhodes, Modern Pharmaceutics, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Liberman & Lachman, Theory and Practice of Industrial Pharmacy
7. M.E.Aulton, Churchill livingstone, Pharmaceutics- The science of dosage form design, Latest edition
8. H. C.Ansel, Lea &Febiger, Introduction to Pharmaceutical Dosage Forms, Philadelphia, 5thedition, 2005

20VP405**: Pharmaceutical Engineering**		**3 Credits; 39 Hrs.**
Unit-I	**Unit operations-** Introduction, classification of unit operations, fundamental principles **Fluid flow-**mention of fluid properties such as viscosity, surface tension of fluid, and hydrostatic infusing fluid flow, Bernoulli's Theorem, flow of liquids in pipes, laminar and turbulent flow	5 Hrs.
Unit-II	**Heat transfer**-mention of different modes of heat transfer e.g. conduction, convection and radiation; Mass transfer and molecular diffusion in liquids, mass transfer in turbulent and laminar flow, interfacial mass transfer	5 Hrs.
Unit-III	**Refrigeration,** air condition and humidification; hygrometry, humidification and dehumidification **Mixing:** A) liquid-liquid mixing, B) Mixing small quantities of solids in liquids, C) Mixing large quantities of solids in liquids, perfect mixing and random mixing, degree of mixing, mechanism of mixing and demixing, rate of mixing, **Drying:** Objectives, applications and mechanism of drying process, merits and demerits of tray driers, drum dryer, spray dryer	8 Hrs.
Unit-IV	**Emulsification and Homogenization:** Process and equipment used and equipment selection for, including colloid mills, Silverson type homogenizer	5 Hrs.
Unit-V	**Filtration:** Objectives, applications factors influencing filtration, filter media, advantages and disadvantages of plate and frame filter **Centrifugation-** objective and requirements ; perforated and non-perforated basket centrifuge, Super centrifuge	5 Hrs.
Notes: BVoC - PMT program is skill-intensive program. Although credits are specified for each courses, the general intent is that hands-on exercises that enhance skills related to the theoretical input shall have to be assigned to students. In general, skill portion be (50%of credits) and theory portion (50% of credits) for each course. For example, if a course has 2 credits, 1 credit (13 hours) will be for theoretical inputs and 1 credit will be for skill based components that are assignments, field visit learning, self study and the like.		

Course objectives:

- To know various unit operations used in pharmaceutical industries
- To understand material handling techniques
- To carryout various processes involved in pharmaceutical manufacturing processes

Course outcomes:

- Explain the fundamental principles different unit operations and their classification
- Describe principles of heat and mass transfer
- Discuss refrigeration principles, mixing of various forms such as solids, liquids
- Explain in details the process of drying, emulsification, homogenization, filtration and centrifugations

Recommended Books:

- Walter L Badger & Julius Banchero, Introduction to chemical engineering
- Martin, Theory and practice of Industrial Pharmacy

- CVS Subrahmanyam, Pharmaceutical engineering principles and practices
- Macabe Smith, Unit operation of chemical engineering