PPSU

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

DEPARTMENT OF PHARMACEUTICAL ENGINEERING

AY 2021-22

VISION – MISSION – PROGRAMME OUTCOMES – PROGRAMME SPECIFIC OUTCOMES

INSTITUTE VISION
To emerge as an Institute of Excellence by imparting value-based education aided with Research, Innovation and Entrepreneurial skills.

INSTITUTE MISSION	
1.	To impart the holistic engineering education of highest quality & prepare socially responsible professionals with entrepreneurial skills.
2.	To prepare value-aided engineering professionals to meet up global industry requirements by imparting cutting edge professional education.
3.	To inculcate the attitude of research and innovation among the stake holders through experiential and project-based teaching-learning pedagogy.
4.	To acquire global talent pool by providing world class amenities for teaching, learning & research.

Graduates will demonstrate ability to:

PEO No	PROGRAMME EUCATIONAL OBJECTIVES
PEO 1	Solve real-world engineering problems, design and develop innovative and cost-effective solutions exhibiting engineering skills/fundamentals to cater needs of society.
PEO 2	Excel in Industry/technical profession, higher studies, and entrepreneurship exhibiting comprehensive competitiveness.
PEO 3	Exhibit professional ethics & values, effective communication, teamwork, multidisciplinary approach, and ability to relate engineering issues to broader societal framework.

PO No	PROGRAMME OUTCOMES
PO 1	Engineering knowledge: Apply knowledge of engineering fundamentals, science, mathematics & engineering specialization for the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate and analyze complex engineering problems leading to substantial conclusions using basic principles of mathematics, science and engineering.
PO 3	Design/development of solutions:

VISION – MISSION – PROGRAMME OUTCOMES – PROGRAMME SPECIFIC OUTCOMES

PO No	PROGRAMME OUTCOMES
	Develop solutions for complex engineering problems and design system components or processes meeting specified needs having due consideration for the safety and societal & environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge & methods like design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid & viable conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for prediction and modeling of complex engineering activities with an understanding of the limitations.
PO 6	The engineer and society: Apply cognitive learning by the contextual knowledge to assess societal, health, safety, legal and cultural issues and following responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge & skill needed for sustainable development.
PO 8	Values & Ethics: Apply basic moral values & ethical principles and pledge to professional ethics/norms and responsibilities of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual/as a team member or as a leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance:

VISION – MISSION – PROGRAMME OUTCOMES – PROGRAMME SPECIFIC OUTCOMES	
PO No	**PROGRAMME OUTCOMES**
	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need, do necessary preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO No	**PROGRAMME SPECIFIC OUTCOMES (PSO)** **PHARMACEUTICAL ENGINEERING**
PSO 1	Acquire and apply industry centric skills in the field of Pharmaceutical Engineering for the benefit of society.
PSO 2	Develop an attitude to accept global challenges and apply chemical & pharmaceutical engineering knowledge for solving engineering problems related to core and interdisciplinary fields.
PSO 3	Prepare technically competent employee, researcher, entrepreneur, excel in competitive exams, and boost passion for the higher studies.

Syllabus Book

B. Tech.
(Pharmaceutical Engineering)

P P Savani University

School of Engineering

Effective From: 2021-22

Authored by: P P Savani University

CONTENT

FIRST YEAR B. TECH.

P P SAVANI UNIVERSITY															
SCHOOL OF ENGINEERING															
TEACHING & EXAMINATION SCHEME FOR B. TECH. PHARMACEUTICAL ENGINEERING PROGRAMME AY:2021-22															
Sem	**Course Code**	**Course Title**	**Offered By**	**Teaching Scheme**					**Examination Scheme**						
				Contact Hours				**Credit**	**Theory**		**Practical**		**Tutorial**		**Total**
				Theory	**Practical**	**Tutorial**	**Total**		**CE**	**ESE**	**CE**	**ESE**	**CE**	**ESE**	
1	SESH1070	Fundamental of Mathematics	SH	3	0	2	5	5	40	60	0	0	50	0	150
	SESH1210	Applied Physics	SH	3	2	0	5	4	40	60	20	30	0	0	150
	SEME1010	Engineering Graphics	ME	3	4	0	7	5	40	60	40	60	0	0	200
	SEME1020	Engineering Workshop	ME	0	2	0	2	1	0	0	50	0	0	0	50
	SEPE1010	Basics of Pharmaceutical Sciences	PE	3	2	0	5	4	40	60	20	30	0	0	150
	SEHV1010	Universal Human Values	SH	2	0	0	2	0	100	0	0	0	0	0	100
						Total	**26**	**19**							**800**
2	SESH1080	Linear Algebra and Calculus	SH	3	0	2	5	5	40	60	0	0	50	0	150
	SESH1240	Electrical & Electronics Workshop	ME	0	2	0	2	1	0	0	50	0	0	0	50
	SECV1040	Basics of Civil & Mechanical Engineering	CV	4	2	0	6	5	40	60	20	30	0	0	150
	SESH1250	Microbiology & Biochemistry	SH	4	2	0	6	5	40	60	20	30	0	0	150
	SECE1010	Basics of Computer & Programming	CE	3	2	0	5	4	40	60	20	30	0	0	150
	CFLS1010	Linguistic Proficiency	CFLS	2	0	0	2	2	40	60	0	0	0	0	100
						Total	**26**	**22**							**750**

P P Savani University
School of Engineering

Department of Applied Science & Humanities

Course Code: SESH1070

Course Name: Fundamentals of Mathematics

Prerequisite Course(s): Algebra, Geometry, Trigonometry & Pre-Calculus till 12^{th} Standard level

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	02	05	40	60	--	--	50	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the course:

To help learners to

- Summarize concept of calculus to enhance ability of analyzing mathematicalproblems.
- Acquire knowledge and ability to work with differentiation and integration forapplications of mathematical techniques in engineering.
- Develop the tool of power series for learning advanced Engineering Mathematics.
- Analyse and solve system of linear equations and understand characteristics ofMatrices.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Calculus** Limits, Continuity, Types of Discontinuity, Successive Differentiation, Rolle's Theorem, LMVT, CMVT, Maxima and Minima.	10	28
2.	**Sequence and Series-I** Convergence and Divergence, Comparison Test, Integral Test, Ratio Test, Root Test, Alternating Series, Absoluteand Conditional Convergence.	12	22
Section II			
Module No.	Content	Hours	Weightage in %

3.	**Sequence and Series-II** Power series, Taylor and Macluarin series, Indeterminate forms and L'Hospitals Rule.	10	20
4.	**Matrix Algebra** Elementary Row and Column operations, Inverse of matrix, Rank of matrix, System of Linear Equations, Characteristic Equation, Eigen values and Eigen vector, Diagonalization, Cayley Hamilton Theorem, Orthogonal Transformation.	13	30
	TOTAL	45	100

List of Tutorials:

Sr. No.	Name of Tutorial	Hours
1.	Calculus-1	04
2.	Calculus-2	02
3.	Integration	04
4	Sequence and Series-1	04
5.	Sequence and Series-2	04
6.	Sequence and Series-3	02
7.	Matrix Algebra-1	04
8.	Matrix Algebra-2	02
9.	Matrix Algebra-3	02
10.	Matrix Algebra-4	02
	TOTAL	30

Text Book:

Title	Author(s)	Publication
Thomas' Calculus	George B. Thomas, Maurice D. Weir and Joel Hass	Pearson
Elementary linear Algebra	Howard Anton and Chrish Rorres	Wiley

Reference Book:

Title	Author(s)	Publication
Advanced Engineering Mathematics	E Kreyszig	John Wiley and Sons
A textbook of Engineering Mathematics	N P Bali and Manish Goyal	Laxmi
Higher Engineering Mathematics	B S Grewal	Khanna
Engineering Mathematics For First Year	T Veerarajan	Tata Mc Graw Hill

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour ofduration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consists of performance of tutorial which will be evaluated out of 10 marks for each tutorial and average of the same will be converted to 30 marks
- MCQ based examination consists of 10 marks.
- Internal Viva consists of 10 marks.

Course Outcome(s):

After the completion of the course, the students will be able to:

SESH1070	**FUNDAMENTALS OF MATHEMATICS**
CO 1	To recall the concepts of limit, continuity and differentiability for analysing mathematical problems.
CO 2	Explain concepts of limit, derivatives and integrals.
CO 3	Analyze the series for its convergence and divergence to slove real world problems.
CO 4	Evaluate linear system using matrices.
CO 5	Adapt the knowledge of eigenvalues and eigenvectors for matrix diagonalization

Mapping of CO with PO-PO

SESH1070	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	1	1								1
CO 2	3	2	1									1
CO 3	3	2	1	1								
CO 4	3	2	1									1
CO 5	3	3	1		1							1

Mapping of CO with PSO

SESH1070	PSO1	PSO2	PSO3
CO 1	3		
CO 2	1	1	
CO 3	1	2	
CO 4	2	1	
CO 5	2	2	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Calculus	1, 2, 3,4
2	Sequence and Series-I	1, 2, 3, 4
3	Sequence and Series-II	1, 2, 3, 4
4	Matrix Algebra	1, 2, 3,4

P P Savani University
School of Engineering

Department of Applied Science & Humanities

Course Code: SESH1210
Course Name: Applied Physics
Prerequisite Course(s): --

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						TOTAL
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		
03	02	--	04	CE	ESE	CE	ESE	CE	ESE	150
				40	60	20	30	--	--	

CE: Continuous Evaluation, **ESE:** End Semester Exam

Objective(s) of the Course:

- To assist students in preparing for a future in engineering, where physics principles can be usedto enhance technology.
- Consciousness about the topics such as Quantum mechanics, Solid State Physics, Lasers and fiber,Semiconductors and electronics.

Course Content:

Section I			
Module No.	Content	Hours	Weightagein %
1.	**Quantum Mechanics:** Wave-Particle Duality, De-Broglie Matter Wave, Phase and Group Velocity, Heisenberg Uncertainty Principle and its Applications, Wave Function and its Significance, Schrodinger's Wave Equation, Particle in One Dimensional Box	06	15
2.	**Acousic and Ultrasonic:** Introduction, Classification and Characterization of Sound, Absorption Coefficients, Sound Absorbing Materials, Sound Insulation, Ultrasonic, Properties of Ultrasonic, Generation of Ultrasonic Applications of Ultrasonic.	05	10
3.	**Solid State Physics** Introduction, Lattice Points and Space Lattice, Unit Cells and LatticeParameters, Primitive Cell, Crystal Systems. The Bravais Space Lattices. Miller Indices, X-Ray Properties, Diffraction and Bragg's Law, Bragg's X-Ray Spectrum	06	10
4.	**Nanophysics** Nanoscale, Surface to Volume Ratio, Surface Effects on Nanomaterials, Quantum Size Effects, Nanomaterials and Nanotechnology, Unusual Properties of Nanomaterials, Synthesis of Nanomaterials, Applications of Nanomaterials	06	15

Section II			
Module No.	Content	Hours	Weightage in %
5.	**Non-Linear Optics:** Laser, Spontaneous and Stimulated Emission of Light, Applications of Laser. Fundamental Ideas about Optical Fibre, Advantages of Optical Fibre of Optical Fibre, Applications of Optical Fibre.	07	12
6.	**DC and AC Circuits Fundamentals** Introduction of Electrical Current, Voltage, Power and Energy; Sources of Electrical Energy Inductor and Capacitor, Fundamental Laws of Electric Circuits – Ohm's Law and Kirchhoff's Laws; Analysisof Series, Parallel and Series-Parallel Circuits. Alternating Voltages and Currents and their Vector and Time Domain Representations, Average and Rms Values, From Factor, Phase Difference, Power and Power Factor, Purely Resistive Inductive and Capacitive Circuits, R-L, R-C, R-L-C Series Circuits, Impedance and Admittance, Circuits in Parallel, Series and Paralle Resonance.	08	25
7.	**Electronics:** Semiconductors, Intrinsic and Extrinsic Semiconductor Advantages of Semiconductor Devices, Diodes, Transistors, Types of Bipolar Junction Transistor, Unijunction Junction Transistor, FET and MOSFETS.	07	13
	TOTAL	45	100

List of Practical:

Sr. No.	Name of the experiment	Hours
1	Volt-Ampere Characteristics of Light Emitting Diode	02
2	Volt-Ampere Characteristics of Zener Diode	02
3	To determine value of Planck's constant (h) using a photovoltaic cell	02
4	To determine the Hall coefficient (R) and carrier concentration of a given material (Ge) using Hall effect.	04
5	To study the Capacitors in series and parallel DC circuit.	04
6	To determine velocity of sound in liquid using Ultrasonic Interferometer	04
7	To study RLC Series circuit.	02
8	To determine numerical aperture of an optical fiber.	04
9	Determination of Young's Modulus of given material.	04
10	Analysis of errors.	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Concept of the Modern Physics	A. Beiser	Tata McGraw-Hill Education
Basic electrical engineering	Kothari and Nagrath	Tata McGraw-Hill Education
Lasers and Nonlinear Optics	G.D. Baruah	Pragati Prakashan

Web Material Link(s):

- http:/nptel.ac.in/course.php

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the Course Coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation Consist of Performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva and practical performance consist of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SESH1210	**APPLIED PHYSICS**
CO 1	Understand the framework of quantum mechanics and apply the knowledge of basic quantum mechanics to construct one dimensional Schrodinger's wave equation.
CO 2	Classify the phenomenon of acoustics and ultrasonic in various engineering field and apply it for various engineering and medical fields. interpret the concept of nanotechnology and understand the synthesis and applications of nanomaterials from technological prospect.
CO 3	Discover the types and properties of superconductors. relate the behavior of superconductors at high temperatures.
CO 4	Describe the laser and articulate the idea of optical fiber communications and apply the concepts of lasers and optical fiber communications in every possible sector.
CO 5	Distinguish pure, impure semiconductors and characteristics of semiconductor devices. This will be able to use basic concepts to analyze and design a wide range of semiconductor devices.

Mapping of CO with PO

SESH1210	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	1			2						1
CO 2	2	3	2			2	3					3
CO 3	2	2	2			2	3					3
CO 4	2	3	2			2	3					3
CO 5	2	3	2			2	3					3

Mapping of CO with PSO

SESH1210	PSO1	PSO2	PSO3
CO 1	3		
CO 2	3		
CO 3	3		
CO 4	2		
CO 5	3		

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Quantum Mechanics:	2,3
2	Acoustic and Ultrasonic:	1,3
3	Nanophysics	2,4
4	Superconductivity	2,6
5	Non linear optics-I	1,2
6	Non linear optics-II	2,3
7	Electronics	3,6

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME1010
Course Name: Engineering Graphics
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	04	--	05	40	60	40	60	--	--	200

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- know conventions and the methods of engineering drawing.
- interpret engineering drawings using fundamental technical mathematics.
- construct basic and intermediate geometry.
- improve their visualization skills so that they can apply these skills in developing newproducts.
- improve their technical communication skill in the form of communicative drawings.
- comprehend the theory of projection.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction:** Importance of the Course; Use of Drawing Instruments and accessories; BIS – SP – 46; Lettering, Dimensioning and Lines; Representative Fraction; Types of Scales (Plain and Diagonal Scales); Construction of Polygons.	03	05
2.	**Engineering Curves:** Classification and Application of Engineering Curves; Construction of Conics, Cycloidal Curves, Involutes and Spiral along with Normal and Tangent to each.	06	15
3.	**Principles of Projections:** Types of Projections; Introduction of Principle Planes of Projections. **Projection of Points & Line:** Projection of Points in all four Quadrants; Projection of Lines with its inclination to one Referral Plane & two Referral Planes.	14	30

	Projection of Plane: Projection of Planes (Circular and Polygonal) with inclination to one Referral Plane and two Referral Planes; Concept of Auxiliary Projection Method.		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Projection and Section of Solids:** **Projection of solids:** Polyhedral, Prisms, Pyramids, Cylinder, Cone, Auxiliary Projection Method, One View, Two View and Three View Drawings. Missing View, Rules for Selection of Views; Sectional View, Section Plane Perpendicular to the HP &VP and other Various Positions, True Shape of Sections.	08	14
5.	**Orthographic Projection:** Types of Projections: Principle of First and Third Angle Projection - Applications & Difference; Projection from Pictorial view of Object, View from Front, Top and Sides; Full Section View.	07	18
6.	**Isometric Projections and Isometric Drawing:** Isometric Scale, Conversion of Orthographic views into Isometric Projection, Isometric View or Drawing.	07	18
	TOTAL	45	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Introduction sheet (dimensioning methods, different types of line, construction of different polygon, divide the line and angle in parts, use of stencil, lettering)	08
2.	Plane scale and diagonal scale	04
3.	Engineering curves	08
4.	Projection of Points & Lines	06
5.	Projection of Planes	08
6.	Projection of solid & Section of solid	10
7.	Orthographic projection	08
8.	Isometric projection	08
	TOTAL	60

Text Book(s):

Title	Author(s)	Publication
A Text Book of Engineering Graphics	P J Shah	S. Chand & Company Ltd., New Delhi
Engineering Drawing	N D Bhatt	Charotar Publishing House, Anand

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 hour of duration andaverage of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Practical:

- Continuous Evaluation consists of Performance of Practical/Tutorial which will be evaluatedout of 10 for each practical/Tutorial and average of the same will be converted to 20 Marks.
- Internal Viva consists of 20 Marks.
- Practical performance/quiz/drawing/test will consist of 30 Marks during End SemesterExam.
- Viva/Oral performance will consist of 30 Marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEME1010	**ENGINEERING GRAPHICS**
CO 1	Learn and understand the bis standards, conventions and methods of engineering drawing.
CO 2	Explore the different methods to draw various engineering curves and its applications.
CO 3	Construct basic and intermediate geometry and comprehend the theory of projection.
CO 4	Improve visualization skills and apply it to develop a new product.

Mapping of CO with PO-PO

SEME1010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1			2				3		1
CO 2	1	1	1		1					3		1
CO 3	1	1	1		1					3		1
CO 4	1	1	2		1					3		1

Mapping of CO with PSO

SEME1010	PSO1	PSO2	PSO3
CO 1	1		
CO 2	2	1	1
CO 3	2	1	1
CO 4	2	1	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction	1, 2
2	Engineering Curves	1, 2, 3
3	Principles of Projections	1, 2, 3
4	Projection and Section of Solids	2, 3, 4
5	Orthographic Projection	2, 3, 4
6	Isometric Projections and Isometric Drawing	2, 3, 4

P P Savani University
School of Engineering

Department of Mechanical Engineering

Course Code: SEME1020
Course Name: Engineering Workshop
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
--	02	--	01	--	--	50	--	--	--	50

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- learn about the safety measures required to be taken while using working in workshop.
- learn about how to select the appropriate tools required for specific operation.
- learn about different manufacturing technique for production out of the given raw material.
- understand applications of machine tools, hand tools, power tools and welding process.

List of Practical:

Sr. No	Name of Practical	Hours
1.	Introduction and Demonstration of Safety Norms. Different Measuring Instruments.	02
2.	To Perform a Job of Fitting Shop.	06
3.	To Perform a Job of Carpentry Shop.	06
4.	To Perform a Job of Sheet Metal Shop.	06
5.	To Perform a Job of Black Smithy Shop.	04
6.	Introduction and Demonstration of Grinding & Hacksaw Cutting Machine.	02
7.	Introduction and Demonstration of Plumbing Shop & Welding Process.	04
	TOTAL	30

Text Book(s):

Title	Author(s)	Publication
Elements of Workshop Technology Vol. I	Hajra Chaudhary S. K.	Media promoters & Publishers
Workshop Technology Vol. I and II	Raghuvanshi B.S.	Dhanpat Rai & Sons

Reference Book(s):

Title	Author(s)	Publication
Workshop Technology Vol. I	W.A.J. Chapman	Edward Donald Publication
Workshop Practices	H S Bawa	Tata McGraw-Hill
Basic Machine Shop Practice Vol. I, II	Tejwani V. K.	Tata McGraw-Hill

Web Material Link(s):

- http://nptel.ac.in/course.php

Course Evaluation:

Practical:

- Continuous Evaluation Consist of Performance of Practical which will be evaluated out of 10for each practical/Tutorial and average of the same will be converted to 30 Marks.
- Internal Viva consists of 20 Marks.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEME1020	**ENGINEERING WORKSHOP**
CO 1	Understand the various measuring instruments.
CO 2	Understand the safety norms required in the workshop.
CO 3	Understand the application of various tools required for different operations.
CO 4	Remember the process of manufacture from a given raw material.
CO 5	Explain various manufacturing processes in machine shop.

Mapping of CO with PO-PO

SEME1020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2					2			2		1	2
CO 2						3		3	3		1	3
CO 3	2					2			1		1	3
CO 4	2								3		2	3
CO 5	2								3		2	3

Mapping of CO with PSO

SEME1020	PSO1	PSO2	PSO3
CO 1	2	3	2
CO 2			
CO 3	2	3	2
CO 4	3	3	3
CO 5	3	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Practical No.	Content	RBT Level
1	Introduction	1,2,4
2	Fitting shop	1,2,3
3	Carpentry and drilling shop	1,2,3
4	Sheet metal shop	2,3,4
5	Smithy shop	2,3,4
6	Introduction to machine tools	2,3,4
7	Introduction to welding and plumbing	2,3,4

P P Savani University
School of Engineering

Department of Pharmaceutical Engineering

Course Code: SEPE1010
Course Name: Basics of Pharmaceutical Sciences
Prerequisite Course(s): ---

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	022	--	04	40	60	20	30	--------	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective of the Course:
To help learners to

- Explain the gross morphology, structure and functions of various organs of the human body.
- Describe the various homeostatic mechanisms and their imbalances.
- Identify the various tissues and organs of different systems of human body.
- Perform the various experiments related to special senses and nervous system.
- Appreciate coordinated working pattern of different organs of each system

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Human body, cells, tissues, organs and systems** Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology. Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signalling pathway activation. Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.	10	30

2.	**Systems: Introduction, classification, structure of organs involved, electrophysiology** • Nervous systems • Endocrine system • Excretory system • Reproductive system • Skeleton system	12	20
Section II			
Module No.	Content	Hours	Weightage in %
3.	**Pathophysiology of various diseases** Basic principles of Cell injury, inflammation and repair Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis) Asthma, Chronic obstructive airways diseases Acute and chronic renal failure Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia. Diabetes, thyroid diseases, disorders of sex hormones Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease. Peptic Ulcer, Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease. Rheumatoid arthritis, osteoporosis, and gout classification, etiology and pathogenesis of cancer Rheumatoid Arthritis, Osteoporosis, Gout Classification, etiology and pathogenesis of Cancer Meningitis, Typhoid, Leprosy, Tuberculosis Urinary tract Infections AIDS, Syphilis, Gonorrhea	13	30
4.	**Natural medicines and holistic approaches of management of diseases.** Role of natural medicines in allopathy and traditional systems of medicines like Ayurveda, Unani, Siddha, and Homeopathy systems of medicine. Cultivation, Collection, Processing and storage of drugs of natural origin and Conservation of medicinal plants. Concept of Tridosha and Ayurvedic principles of treatment of diseases.	10	20
	TOTAL	45	100

List of Practical/Tutorial:

Sr. No	**Name of Practical**	**Hours**
1.	Study of compound microscope.	02
2.	Microscopic study of epithelial and connective tissue	03
3.	Microscopic study of muscular and nervous tissue	03

4.	Recording of body temperature, blood pressure, heart rate and lung vital capacity.	03
5.	Determination of bleeding time, clotting time, Hb content and blood group.	03
6.	Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.	03
7.	Recording of basal mass index	02
8.	Demonstration of total blood count by cell analyser.	03
9.	Permanent slides of vital organs and gonads.	04
10.	Determination of cloud point of a surfactant in the presence of salts.	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Essentials of Medical Physiology	K. Sembulingam and P. Sembulingam	Jaypee brother's medical publishers, New Delhi.
Anatomy and Physiology in Health and Illness	Kathleen J.W. Wilson, Churchill Livingstone	New York Publishers
Text book of Medical Physiology	Arthur C, Guyton and John E. Hall	Miamisburg, OH, U.S.A.
Practical workbook of Human Physiology	K. Srinageswari and Rajeev Sharma	Jaypee brother's medical publishers, New Delhi.

Reference book:

Title	Author/s	Publication
Physiological basis of Medical Practice-Best and Tailor	Williams & Wilkins Co	Riverview, MI USA
Textbook of Medical Physiology	Arthur C, Guyton and John. E. Hall.	Miamisburg, OH, U.S.A.
Human Physiology (vol 1 and 2)	Dr. C.C. Chatterrje	Academic Publishers Kolkata

Course Evaluation:

Theory:

- Continuous Evaluation consists of two internal exams which carry 30 marks each and the final evaluation will be counted with average of 30 Marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End semester examination consists of 60 marks.

Practical:

- Continuous Evaluation consist of performance based on practical which should be evaluated out 10 marks each in the next turn and average of the same will be converted to 10 marks.
- Internal viva component carries 10 marks of evaluation.
- Practical performance/quiz/drawing/test consists of 15 marks evaluation during end semester exam.
- Viva/Oral performance consists of 15 marks evaluation during end semester examination.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE1010	BASIC OF PHARMACEUTICAL SCIENCES
CO 1	Describe basics functions of cells, tissues, organs and systems involved in normal functioning of human body.
CO 2	Summarize functional characteristics of various systems.
CO 3	Describe the fundamental physiological mechanism involves in demonstrated practical.
CO 4	Interlinking various systems in terms of feedback mechanisms and perform various tests related to blood cells counts which relates with the diagnosis of various disease conditions.
CO 5	Appreciate the value of indigenous medicinal systems of india like ayurveda in treatment of various diseases.

Mapping of CO with PO

SEPE1010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
O 1	1					3		3	1	1		
CO 2					1	3				1		
CO 3	1				1	2		3	1			1
CO 4								3	1	1		3
CO 5						3						1

Mapping of CO with PSO

SEPE1010	PSO1	PSO2	PSO3
CO 1	1		2
CO 2	1		3
CO 3	1		1
CO 4	3	3	
CO 5		1	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Human body, cells, tissues, organs and systems	1,2
2	Systems: Introduction, classification, structure of organs involved, electrophysiology	1,2
3	Pathophysiology of various diseases	2,3,4
4	Natural medicines and holistic approaches of management of diseases	1,2,3,4

P P Savani University
School of Engineering
Department of Science & Humanities

Course Code: SESH1080
Course Name: Linear Algebra & Calculus
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	05	40	60	--	--	50	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- learn about and work with vector space, linear transformation and inner productspace.
- apply concepts of linear algebra for solving science and engineering problems.
- introduce the concept of improper integral and Beta-Gamma Function.
- develop the tool of Fourier series for learning advanced Engineering Mathematics.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Vector Space** Concept of vector space, Subspace, Linear Combination, Linear Dependence and Independence, Span, Basis and Dimension, Row Space, Column Space and Null Space, Rank and Nullity.	09	20
2.	**Linear Transformation** Introduction of Linear Transformation, Kernal and Range, Rank and Nullity, Inverse of Linear Transformation, Rank Nullity Theorem, Composition of Linear Maps, Matrix associated with linear map.	07	15
3.	**Inner Product Space** Inner Product, Angle and Orthogonality, Orthogonal projection, Gram- Schmidt process and QR Decomposition, Least square decomposition, Change ofbasis.	07	15

Section II			
Module No.	Content	Hours	Weightage in %
4.	**Beta and Gamma function** Improper Integrals, Convergence, Properties of Beta and Gamma Function, Duplication Formula (withoutproof)	06	14
5.	**Fourier Series** Periodic Function, Euler Formula, Arbitrary Period, Even and Odd function, Half Range Expansion, Parseval's Theorem	08	18
6.	**Curve tracing** Tracing of Cartesian Curves, Polar Coordinates, Polar and Parametric Form of Standard Curves, Areas and Length in Polar co-ordinates	08	18
	TOTAL	45	100

List of Tutorial:

Sr. No.	Name of Tutorial	Hours
1.	Vector Space-1	04
2.	Vector Space-2	02
3.	Linear Transformation-1	04
4	Linear Transformation-2	02
5.	Inner Product-1	04
6.	Inner Product-2	02
7.	Beta and Gamma Function-1	04
8.	Beta and Gamma Function-2	02
9.	Curve tracing-1	04
10.	Curve tracing-2	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Thomas' Calculus	George B. Thomas, Maurice D. Weir and Joel Hass	Pearson
Elementary Linear Algebra	Howard Anton and Chrish Rorres	Wiley

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests, each of 30 marks and 1 hour of durationand average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the CourseCoordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous evaluation consists of performance of tutorial which will be evaluated outof 10 Marks for each tutorial and average of the same will be converted to 30 marks.
- MCQ based examination consists of 10 marks.
- Internal Viva consists of 10 marks.

Course Outcome(s):

After the completion of the course, the students will be able to:

SESH1080	**LINEAR ALGEBRA & CALCULUS**
CO 1	Determine the basis and dimension of vector spaces and subspaces.
CO 2	Discuss the matrix representation of a linear transformation given bases of the relevant vector space.
CO 3	Identify the ordinary differentials and partial differentials and solve the maximum and minimum value of function.
CO 4	Classify gamma, beta functions & their relation which is helpful to evaluate some definite integral arising in various branch of engineering.
CO 5	Construct the graphs for function with intervals and identify more application for function.

Mapping of CO with PO-PO

SESH1080	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1										
CO 2	1											
CO 3	2	1										
CO 4	1	1										
CO 5	1											

Mapping of CO with PSO

SESH1080	PSO1	PSO2	PSO3
CO 1			
CO 2			
CO 3	1		
CO 4			
CO 5			

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Vector Space	1, 2, 3, 4

2	Linear Transformation	1, 2, 3, 4
3	Inner product space	1, 2, 3, 4
4	Partial Derivatives	1, 2, 4, 5
5	Beta and Gamma Function	1, 2, 4, 5
6	Curve Tracing	1, 2, 4, 5, 6

P P Savani University
School of Engineering
Department of Applied sciences & Humanities

Course Code: SESH1240
Course Name: Electrical & Electronics WorkshopPrerequisite
Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
--	02	--	01	--	--	50	--	--	--	50

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- identify basic fundamental electronic components in circuits.
- learn to use common electronic component on breadboard.
- understand components of instruments, terminology and applications.

List of Practical:

Sr No	Name of Practical	Hours
1	Understanding of electronic component with specification.	02
2	Understanding of Galvanometer, Voltmeter, Ammeter, Wattmeter andMultimeter	02
3	Understanding of breadboard connections	02
4	Drawing and wiring of basic circuits on breadboard	02
5	Verification of Ohm's law	02
6	Half wave, full wave using centre tap transformer and full wave bridgerectifier	03
7	Kirchhoff's laws (KVL, KCL).	03
8	Faraday's laws of Electromagnetic Induction and Electricity Lab	04
9	LDR characteristics	02
10	Study of CRO, measurement of amplitude (voltage) & time period (frequency)	04
11	PCB designing	04
	TOTAL	30

Text Book:

Title	Author/s	Publication
Electronic Principles	Albert Malvino and David J Bates	Mc Graw Hill(7th Edition)

Reference Book:

Title	Author/s	Publication
Electronic Devices	Thomas L. Floyd	Pearson (7th Edition)
Electronic Devices and Circuits	David A. Bell	Oxford Press (5th Edition)
Integrated Electronics	Jacob Millman, Christos	Tata McGraw Hill (2nd Edition)

Course Evaluation:

Practical:

- Continuous Evaluation Consist of Performance of Practical which should be evaluated out of 10 foreach practical in the next turn and average of the same will be converted to 20 Marks.
- Internal viva consists of 20 marks.

Course Outcome(s):

After the completion of the course, the students will be able to:

SESH1240	ELECTRICAL & ELECTRONICS WORKSHOP
CO 1	Identify the ability to design various electronic circuit on a bread board.
CO 2	Recognize the basic electronic devices and components in a circuit connection.
CO 3	Identify the ability to design a PCB.
CO 4	Define the practical side of basic physics laws.

Mapping of CO with PO-PO

SESH1240	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2	3	3	2	2		3			3
CO 2	2	3	2	3	3	2	2		3			3
CO 3	2	3	3	3	3	2	2		3			3
CO 4	2	3	2	3	3	2	2		3			3

Mapping of CO with PSO

SESH1240	PSO1	PSO2	PSO3
CO 1	3	2	
CO 2	3	2	
CO 3	3	2	
CO 4	3	2	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Electronic Components	1,2,3,4
2	Electronic Devices	1,2,3,4
3	Understanding of Breadboard	1,2,4,5,6
4	Wiring of Breadboard	1,2,4,5,6
5	Ohm's Law	1,2,3,4
6	Rectifiers	1,2,3,5,6
7	KCL & KVL	1,2,3,4,6
8	LDR	1,2,3,6
9	Electricity Lab	1,2,3,4
10	CRO	1,2,4,5
11	PCB	1,2,6

P P Savani University
School of Engineering
Department of Civil Engineering

Course Code: SECV1040
Course Name: Basics of Civil & Mechanical Engineering
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
04	02	--	05	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- study the fundamentals of mechanical systems.
- study and appreciate significance of mechanical engineering in different fields of engineering.
- carry out simple land survey and recent trends in civil engineering.
- understand components of building, building terminology and construction materials.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Civil Engineering: An Overview** Introduction, Branches, Scope, Impact, Role of Civil Engineer, Unit of Measurement, Unit Conversion (Length, Area, Volume)	03	04
2.	**Introduction to Surveying and Levelling:** Introduction, Fundamental Principles, Classification **Linear Measurement:** Instrument Used, Chaining on Plane Ground, Offset, Ranging **Angular Measurement:** Instrument Used, Meridian, Bearing, Local Attraction **Levelling:** Instrument Used, Basic Terminologies, Types of Levelling, Method of Levelling **Modern Tools:** Introduction to Theodolite, Total Station,GPS	07	12
3.	**Building Materials and Construction:** Introduction (Types and Properties) to Construction Materials Like Stone, Bricks, Cement, Sand, Aggregates,	10	14

	Concrete, Steel. Classification of Buildings, Types of Loads Acting on Buildings, Building Components and their Functions, Types of Foundation and Importance, Symbols Used in Electrical Layout, Symbols Used for Water Supply, Plumbing and Sanitation		
4.	**Construction Equipment:** Types of Equipment- Functions, Uses. Hauling Equipment- Truck, Dumper, Trailer. Hoisting Equipment- Pulley, Crane, Jack, Winch, Sheave Block, Fork Truck. Pneumatic Equipment-Compressor. Conveying Equipment- Package, Screw, Flight/scrap, Bucket, Belt Conveyor. Drill, Tractor, Ripper, Rim Pull, Dredger, Drag Line, Power Shovel, JCB, HOE.	04	08
5.	**Recent Trends in Civil Engineering:** Mass Transportation, Rapid Transportation, Smart City, Sky Scarper, Dams, Rain Water Harvesting, Batch Mix Plant, Ready Mix Concrete Plant, Green Building, Earth Quake Resisting Building, Smart Material	06	12
Section II			
Module No.	Content	Hours	Weightage in %
6.	**Basic Concepts of Thermodynamics:** Prime Movers - Meaning and Classification; the Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific Heat Capacity, Internal Energy, Specific Volume; Thermodynamic Systems, All Laws of Thermodynamics	04	08
7.	**Fuels and Energy:** Fuels Classification: Solid, Liquid and Gaseous; their Application, Energy Classification: Conventional and Non-Conventional Energy Sources, Introduction and Applications of Energy Sources like Fossil Fuels, Solar, Wind, and Bio-Fuels, LPG, CNG, Calorific Value	04	08
8.	**Basics of I.C Engines:** Construction and Working of 2 Stroke & 4 Stroke Petrol and Diesel Engines, Difference Between 2-Stroke - 4 Stroke Engine & Petrol-Diesel Engine, Efficiency of I. C. Engines	12	18
9.	**Power Transmission Elements:** Construction and Applications of Couplings, Clutches and Brakes, Difference Between Clutch and Coupling, Types of Belt Drive and Gear Drive	10	16
	TOTAL	60	100

List of Practical:

Sr. No.	Name of Practical	Hours
1.	Unit conversation Exercise and Chart preparation of building components	02
2.	Linear measurements	02
3.	Angular measurements	02
4.	Determine R. L of given point by Dumpy level. (Without Change Point)	02
5.	Determine R. L of given point by Dumpy level. (With Change Point)	02
6.	Presentation on various topics as in module about recent trends	04
7.	To understand construction and working of various types of boilers	04
8.	To understand construction and working of mountings	04
9.	To understand construction and working of accessories	04
10.	To understand construction and working 2 –stroke & 4 –stroke Petrol Engines	02
11.	To understand construction and working 2 –stroke & 4 –stroke Diesel Engines	02
	TOTAL	30

Text Book(s):

Title	Author(s)	Publication
Elements of Mechanical Engineering	S. B. Mathur, S. Domkundwar	Dhanpat Rai & Sons Publications
Elements of Mechanical Engineering	Sadhu Singh	S. Chand Publications
Elements of Civil Engineering	Anurag A. Kandya	Charotar Publication
Surveying Vol. I & II	Dr. B. C. Punamia	Laxmi Publication

Reference Book(s):

Title	Author(s)	Publication
Thermal Engineering	R. K. Rajput	Laxmi Publications
Basic Mechanical Engineering	T.S. Rajan	Wiley Eastern Ltd., 1996.
Surveying and Levelling	N. N. Basak	Tata McGraw Hill
Surveying Vol. I	S. K. Duggal	Tata McGraw Hill
Surveying and Levelling	R. Subramanian	Oxford University
Building Construction and Construction Material	G. S. Birdie and T. D. Ahuja	Dhanpat Rai Publishing
Engineering Material	S.C. Rangwala	Charotar Publication

Web Material Link(s):

- http://nptel.ac.in/course.php
- http://nptel.ac.in/courses/105107157/
- http://nptel.ac.in/courses/105101087/
- http://nptel.ac.in/courses/105107121/

Course Evaluation:

Theory:

- Continuous evaluation consists of two tests each of 30 marks and 1 hour of duration andaverage of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End Semester Examination will consist of 60 marks.

Practical:

- Continuous Evaluation consists of performance of practical which will be evaluated out of 10marks for each practical and average of the same will be converted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral performance of 15 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SECV1040	**BASICS OF CIVIL AND MECHANICAL ENGINEERING**
CO 1	Apply the principles of basic mechanical engineering.
CO 2	Comprehend the importance of mechanical engineering equipment like ic engine and power transmission elements.
CO 3	Understand different structural loads, components, materials and equipment used in the construction of a building.
CO 4	Adapt various methods of area plotting and marking before starting the construction activity.

Mapping of CO with PO

SECV1040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	1	3	2	2						3
CO 2	2	3	1	3	2	2						3
CO 3	1	3	1	3	2	2						3
CO 4	1	3	1	3	2	2						3

Mapping of CO with PSO

SECV1040	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	2	2	2
CO 3	3	2	2
CO 4	3	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Civil Engineering: An Overview	1, 2, 3, 4
2	Introduction to Surveying and Levelling	1, 2, 3, 4
3	Building Materials and Construction	1, 2, 3, 4
4	Construction Equipment	1, 2, 4, 5
5	Recent Trends in Civil Engineering	1, 2, 4, 5
6	Basic Concepts of Thermodynamics	1, 2, 4, 5, 6
7	Fuels and Energy	2,3,4
8	Basics of Steam Generators	3,4,5
9	Basics of I.C Engines	2,3,4
10	Power Transmission Elements	1, 2, 3, 4

P P Savani University
School of Engineering

Department of Science & Humanities

Course Code: SESH1250
Course Name: Microbiology & Biochemistry
Prerequisite Course(s): ---

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
04	02	--	05	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand methods of identification, cultivation and preservation of various microorganisms
- learn importance of sterilization in microbiology. and pharmaceutical industry
- learn sterility testing of pharmaceutical products.
- understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs,therapeutic and diagnostic applications of enzymes.

Course Content:

Section-I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Microbiology** Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media. Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy	10	15
2.	**Sterilization** Study of principle, procedure, merits, demerits and applications of Physical, chemical and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods, Equipment employed in large scale sterilization. Sterility indicators. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP.	12	15

3.	**Pharmaceutical Microbiology** Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	8	20
Section-II			
Module No.	Content	Hours	Weightage in %
4.	**Carbohydrate, lipid and Amino acid metabolism** Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance, HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency, Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance, Hormonal regulation of blood glucose level and Diabetes mellitus. Electron transport chain (ETC) and its mechanism. β-Oxidation of saturated fatty acid (Palmitic acid), Formation and utilization of ketone bodies; Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D.	10	15
5.	**Biomolecules and Bioenergetics** Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP	8	15
6.	**Enzymes** Introduction, properties, nomenclature and IUB classificationof enzymes Enzyme kinetics. Enzyme inhibitors with examples, Regulation of enzymes: enzyme induction and repression, allosteric enzymesregulation.	6	10
7.	**Nucleic acid metabolism and genetic information transfer** Biosynthesis of purine and pyrimidine nucleotides Catabolism of purine nucleotides and Hyperuricemia and Gout Disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitor.	6	10
	TOTAL	60	100

List of Practical/Tutorial:

Sr. No	Name of Practical	Hours
1.	Introduction and study of different equipment and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.	03
2.	Sterilization of glassware, preparation and sterilization of media.	03
3.	Sterility testing of pharmaceuticals	03
4.	Staining methods- Simple, Grams staining and acid-fast staining (Demonstration with practical).	03
5.	Bacteriological analysis of water	03
6.	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)	03
7.	Identification tests for Proteins (albumin and Casein)	03
8.	Determination of blood creatinine	03
9.	Determination of blood sugar	03
10.	Determination of serum total cholesterol	03
	TOTAL	30

Text Book:

Title	Author/s	Publication
Principles of Biochemistry	Lehninger	WH Freeman
Harper's Biochemistry	Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.	Wiley India Edition
Pharmaceutical Microbiology	W.B. Hugo and A.D. Russel	Blackwell Scientific publications, Oxford

Reference Book:

Title	Author/s	Publication
Industrial Microbiology, 4th edition	Prescott and Dunn.	CBS Publishers & Distributors, Delhi
Microbiology	Pelczar, Chan Kreig Rodwell.	Tata McGraw Hill
Cooper and Gunn's: Tutorial Pharmacy	Cooper and Gunn	CBS Publisher and Distribution.

Course Evaluation:

Theory:

- Continuous Evaluation consists of two internal exams which carry 30 marks each and the final evaluate will be counted with average of 30 Marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by Course Coordinator.
- End semester examination consists of 60 marks

Practical:

- Continuous Evaluation consist of performance based on practical which should be evaluated outof 10 marks each in the next turn and average of the same will be converted to 10 marks.
- Internal viva component carries 10 marks of evaluation.
- Practical performance/quiz/drawing/test consists of 15 marks evaluation during end semesterexam.
- Viva/Oral performance consists of 15 marks evaluation during end semester examination.

Course Outcome(s):

After the completion of the course, the students will be able to:

SESH1250	**MICROBIOLOGY & BIOCHEMISTRY**
CO 1	Knowledge of sterilize consumables to be used in microbial experiments.
CO 2	Perform sterility testing and microbial assay of pharmaceutical products.
CO 3	Describe applications of equipment used in microbiology laboratory.
CO 4	Identify biochemical aspects of cell metabolism and enzyme.
CO 5	Summarize metabolic pathway of important biomolecules.

Mapping of CO with PO

SESH1250	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	1	1			2			3		2
CO 2	2	3	1	2			2			3		2
CO 3	2	3	1	3			2			3		3
CO 4	2	3	3	3			2			3		3
CO 5	2	3	3	3			2			3		3

Mapping of CO with PSO

SESH1250	PSO1	PSO2	PSO3
CO 1		3	1
CO 2		3	1
CO 3	2	3	1
CO 4	2	3	1
CO 5	2	3	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Microbiology	1,2
2	Sterilization	3,4
3	Pharmaceutical Microbiology	1,2
4	Carbohydrate, lipid and Amino acid metabolism	2,4,5
5	Biomolecules and Bioenergetics	1,2
6	Enzymes	2,3,4
7	Nucleic acid metabolism and genetic information	1,2,5

P P Savani University
School of Engineering
Department of Computer Engineering

Course Code: SECE1010
Course Name: Basics of Computer and Programming
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/ Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand basic components of computer system.
- identify appropriate approach to computational problems.
- develop logic building and problem-solving skill.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Computer and its Architecture:** Introduction and Characteristics, Generation, Classification, Applications, Central Processing Unit, Communication between Various Units, Processor Speed, Various Input and Output Devices.	03	10
2.	**Memory and Operating Systems:** Introduction to Memory, Memory Hierarchy, Primary Memory and its Type, Secondary Memory, Classification of Secondary Memory, Various Secondary Storage Devices and their Functioning, their Merits and Demerits, Evolution of Operating System, Types and Functions of Operating Systems,	06	15
3.	**Recent Advances in Computer:** Introduction to Emerging Areas like Artificial Intelligence, IoT tools, Data Science, Sensors, 3D Printing, Automization in the field of Civil, Mechanical and Chemical.	05	10
4.	**Computer Programming Language:** Introduction to different types of Programming Languages, Flowcharts and Algorithms. Introduction to C Programming Language, Features of C, Structure of C Program, Development of Program, Types of Errors, Debugging and Tracing Execution of Program.	08	15

Section II			
Module No.	Content	Hours	Weightage in %
5.	**Constants, Variables and data Types:** Character Set, C tokens, Keyword, Constants and Variables, Data Types - Declaration and Initialization, User define type Declarations Typedef, Enum, Basic Input and Output Operations, Symbolic Constants	05	10
6.	**Operators and Expression and Managing I/O operations**: Introduction to Operators and its Types, Evaluation ofExpressions, Precedence of Arithmetic Operators, Type Conversions Expressions, Operator Precedence and Associativity. Managing Input and Output, Reading a Character, Writing a Character, Formatted Input, Formatted Output.	07	16
7.	**Conditional statement and branching:** Decision Making & Branching: Decision Making with If & If ... Else Statements, If - Else Statements (Nested Ladder), The Switch & go - to Statements, The Ternary (?:) Operator Looping: The While Statement, The Break Statement & The Do. While Loop, The FOR Loop, Jump Within Loops - Programs.	06	12
8.	**Arrays and Strings:** Introduction to Array, One Dimensional Array, Two Dimensional Arrays, Declaring and Initializing String Variables, Arithmetic Operations on Characters, Putting Strings Together, Comparison of Two Strings, Basic String Handling Functions	05	12
	TOTAL	45	100

List of Practical:

Sr. No	Name of Practical	Hours
1.	Introduction to Basic Command	04
2.	Word Processing, Spreadsheets and Presentation Exercises	06
3.	Introduction to Octave Environment	04
4.	Implementation in C for conditional statement and branching Implementation of if, if...else, nested if...else and switch statementsImplementation of while loop, do...while loop and for loop	06
5.	Implementation of 1-D and 2-D array	06
6.	Implementation of in-built string functions, application programs of array and strings	04
	TOTAL	30

Text Book(s):

Title	Author(s)	Publication
Programming in ANSI C	E. Balagurusamy	Tata McGraw Hill
Introduction to Computer Science	ITL Education Solutions Limited	Pearson Education

Reference Book(s):

Title	Author(s)	Publication
Programming in C	Ashok Kamthane	Pearson
Let Us C	Yashavant P. Kanetkar	Tata McGraw Hill
Introduction to C Programming	Reema Thareja	Oxford Higher Education
Programming with C	Byron Gottfried	Tata McGraw Hill

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests of 30 marks and 1 hour of duration and averageof the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by CourseCoordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of the performance of practical, which will be evaluated out of 10 per each practical. At the end of the semester, the average of the entire practical will beconverted to 10 marks.
- Internal viva consists of 10 marks.
- Practical performance/quiz/test consists of 15 marks during End Semester Examination.
- Viva/Oral performance consists of 15 marks during End Semester Examination.

Course Outcome(s):

After the completion of the course, the students will be able to:

SECE1010	BASICS OF COMPUTER PROGRAMMING
CO 1	Observe the different types of operating systems and its functionalities.
CO 2	Explore new emerging area in computer field.
CO 3	Apply basic principles of imperative and structural programming to solve complex problems.
CO 4	Classify the types of errors occur while running the program.

Mapping of CO with PO

SECE1010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		1										
CO 2		1		2	1						2	
CO 3		3	2	1								
CO 4		1	1	1								

Mapping of CO with PSO

SECE1010	PSO1	PSO2	PSO3
CO 1	3	3	1
CO 2	3	1	3
CO 3	3	3	1
CO 4	1	3	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Computer and its Architecture	1,2
2	Memory and Operating Systems	1,3
3	Recent Advances in Computer	1,2
4	Computer Programming Language	2,3,4
5	Constants, Variables and data Types	3,4,5,6
6	Operators and Expression and Managing I/O operations	2,3,4
7	Conditional statement and branching	1,4,5,6
8	Arrays and Strings	2,4,5

SECOND YEAR B. TECH.

		P P SAVANI UNIVERSITY														
		SCHOOL OF EEENGINEERING														
		TEACHING & EXAMINATION SCHEME FOR B.TECH. PHARMACEUTICAL ENGINEERING PROGRAMME AY: 2021-22														
Sem	Course Code	Course Name	Offered by	Teaching Scheme				Credit	Examination Scheme						Total
				Contact Hours					Theory		Practical		Tutorial		
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
3	SEPE2010	Pharmaceutical Chemistry	PE	3	2	0	5	4	40	60	20	30	0	0	150
	SEPE2020	Physical Pharmaceutics	PE	3	0	0	3	3	40	60	0	0	0	0	100
	SEPE2910	Industry Aligned Learning-I	PE	1	0	0	1	1	100	0	0	0	0	0	100
	SECH2010	Chemical Process	CH	3	0	1	4	4	40	60	0	0	50	0	150
	SECH2020	Mechanical Operations	CH	3	2	0	5	4	40	60	20	30	0	0	150
	SECH2040	Chemical Engineering	CH	2	0	0	2	2	40	60	0	0	0	0	100
	CFLS1020	Global communication skills	CFLS	2	0	0	2	2	40	60	0	0		0	100
	SEPE2930	Industrial Exposure	PE	2			0	2	0	0	100	0	0	0	100
		Total					**22**	**22**							**950**
4	SEPE2040	General Pharmacology-I	PE	3	0	0	3	3	40	60	0	0	0	0	100
	SEPE2050	Molecular Biology & Genetic	PE	4	2	0	6	5	40	60	20	30	0	0	150
	SEPE2920	Industry Aligned Learning-II	PE	2	0	0	2	2	100	0	0	0	0	0	100
	SECH2050	Fluid Flow operations	CH	3	2	0	5	4	40	60	20	30	0	0	150
	SECH2061	Physical, Inorganic &	CH	3	2	0	5	4	40	60	20	30	0	0	150
	SECH2070	Chemical Engineering Thermodynamics -I	CH	3	0	2	5	5	40	60	0	0	50	0	150
	CFLS3010	Foreign Language-I	CFLS	2	0	0	2	2	40	60	0	0	0	0	100
	SEPD3040	Integrated Personality	SEPD	2	0	0	2	2	100	0	0	0	0	0	100
							30	**26**							**1000**

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE2010
Course Name: Pharmaceutical Chemistry
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Basic knowledge of reactive intermediates.
- The core concepts of organic chemistry i.e. resonance, hyper conjugation, inductive effect etc.
- Knowledge of the increasingly important role played by organic and transition metals reagents

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Principles of test for purity in pharmaceutical substances** Identification and characterisation of impurities in pharmaceutical substances, Limit tests: Definition, importance, general procedure for limit test for chlorides, sulphates, iron, arsenic, heavy metals, lead and modifications with suitable examples.	07	15
2.	**Reactive Intermediates & Polar Effects** Concepts of aromaticity- Huckell's Rule, benzenoid (Naphthalene) and non-benzenoid (Azulene) aromatic compounds. Definition, generation, stability, structure and reactivity of free radicals, carbocations, carbanions, carbenes. Inductive effect, electrometric effect, resonance effect, hyper conjugation, steric inhibition of resonance- examples. The influence of these effects on the acidity and basicity of organic compounds.	10	20
3.	**Reagents in Organic Synthesis** Synthesis and application of Grignard reagent, LDA, DIBAL, Zn-Hg/HCl, DCC.	05	15
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Mechanisms of Organic Reactions**	08	15

	Mechanism of alkyl and aryl halides, mechanism of aromatic electrophilic and nucleophilic substitution - alcohols, aldehydes, ketones, carboxylic acids. Organic named reactions Friedel-Craft reaction, Beckmann rearrangement, Aldol condensation, Benzoin, Hofmann rearrangement, Fries rearrangement.		
5.	**Stereochemistry** Introduction, stereoisomerism, geometrical isomerism,E-Z system of nomenclature, Optical isomerism, Symmetry and chirality. Optical isomerism in lactic acid and tartaric acid, Enantiomers, diastereomers, conformational analysis of 1,2 dichloride Ethane and Cyclohexane.	08	20
6.	**Important inorganic gases** Oxygen, Nitrogen, Nitrous Oxide, carbon dioxide, Helium, Ammonia and their compounds as per I.P.	07	15
	Total	45	100

List of Experiments

S.no	**Experiment list**	**Hours**
1	Identification of organic compounds based on detection of elements.	03
2	Determination of physical constants, group solubility, functional groups and preparation of derivatives.	03
3	Estimation of functional groups like carboxyl, hydroxyl, amino, acetyl, carbonyl, unsaturation, ester group and amino nitrogen.	04
4	Determination of viscosity of a liquid using Ostwald Viscometer	04
5	Determination of mutual solubility curve of phenol and water.	04
6	Determination of end point in a typical titration by Conductometric method.	04
7	Determination of velocity constant of a first order reaction.	04
8	Determination of end point in a typical titration by Conductometric method.	04
	TOTAL	30

Text Book(s):

Title	**Author/s**	**Publication**
Practical Pharmaceutical Chemistry	Beckett, A.H. and Stenlake, J.B.	CBS Publications, 1997.
Pharmaceutical Chemistry" Organic & Inorganic	Chatwal, G.R.	Himalaya Publications.

Reference Book(s):

Title	**Author/s**	**Publication**
Pharmaceutical Chemistry: Therapeutic aspects of Biomacromolecules	Blanders, Christie M.	John Wiley & Sons
Textbook of Pharmaceutical Chemistry" Part-I Inorganic, Part II Organic Chemistry	Mohammed Ali	CBS Publications, 1997.

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE2010	**PHARMACEUTICAL CHEMISTRY**
CO 1	Interpret mechanism of attack of electrophiles and nucleophiles.
CO 2	Acquire the knowledge of optical isomerism, geometrical isomerism and conformational isomerism.
CO 3	Identification of drugs containing various heterocyclic moieties.
CO 4	knowledge in limit tests of impurities in pharmaceutical substances.
CO 5	Ability to prepare pharmaceutical aids with knowledge of inorganic gases and inorganic compounds.

Mapping of CO with PO

SEPE2010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2											
CO 2	1						1			1		1
CO 3	1	1					2					1
CO 4	1	2		2			2					
CO 5				1			2			1	3	1

Mapping of CO with PSO

SEPE2010	PSO1	PSO2	PSO3
CO 1	1		1
CO 2	2		1
CO 3	3	3	2
CO 4	1		1
CO 5	1		2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Principles of test for purity in pharmaceutical substances	2,4,5
2	Reactive Intermediates & Polar Effects	1,2
3	Reagents in Organic Synthesis	1,2,5
4	Mechanisms of Organic Reactions	1,2,4,5
5	Stereochemistry	1,2
6	Important inorganic gases	1,2

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE2020
Course Name: Physical Pharmaceuticals
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Understand various physicochemical properties of drug molecules in the designing.
- Know the principles of chemical kinetics & to use them in assigning expiry date.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Micromeritics and powder rheology** Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle volume, optical microscopy, sieving, sedimentation, measurement of particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness and flow properties.	08	15
2.	**Surface and Interfacial Phenomenon** Liquid interface, surface and interfacial tension, surface free energy, measurement of surface and interfacial tensions, free energy, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid interface, solid gas and solid-liquid interface, complex films, electrical properties of interface.	07	20
3.	**Viscosity and Rheology** Newtonian system, Law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity: capillary, falling ball, rotational viscometers.	07	15
Section II			
Module No.	Content	Hours	Weightage in %

4.	**Dispersion Systems** Colloidal dispersions: Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy. Suspensions and Emulsions: Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicle, rheological considerations, emulsions; types, theories, physical stability.	09	20
5.	**Diffusion and Dissolution** Definitions, Steady state diffusion, Procedures and apparatus, Dissolution, Drug release. Complexation and protein binding Metal complexes, organic molecular complexes, inclusion compounds, methods of analysis, protein binding, complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.	07	10
6.	**Kinetics and Drug Stability** General considerations and concepts, half-life determination, Influence of temperature, light, catalytic species, solvent and other factors, Accelerated stability study, expiration dating.	07	20
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Martin's Physical Pharmacy and Pharmaceutical Sciences	Sinko, Patrick J.	Lippincott Williams & Wilkins Publishing, 2006
Cooper and Gunn's Tutorial Pharmacy	Carter, S.J.	6th Edition. CBS Publishers, 1986.

Reference Book(s):

Title	Author/s	Publication
The Physicochemical Basis of Pharmaceuticals	Monihan, Humphery and Abina Gean	Oxford University Press, 2009

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE2020	PHYSICAL PHARMACEUTICALS
CO 1	Review various physicochemical properties of drug molecules in the designing the dosage form.
CO 2	Know the principles of chemical kinetics & to use them in assigning expiry date for formulation.
CO 3	Acquire working knowledge and understanding the concepts of colloids and its

	applications.
CO 4	Learn the steps involved in the preparation of pharmaceutical buffers and its importance.

Mapping of CO with PO

SEPE2020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	1		1				1	1		1
CO 2	1	1	1		2				1	1		
CO 3	1											
CO 4	1	1			3				1	1		1

Mapping of CO with PSO

SEPE2020	PSO1	PSO2	PSO3
CO 1	3	1	
CO 2		2	1
CO 3	1	1	
CO 4	3		

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Micromeritics and powder rheology	1,2,3
2	Surface and interfacial phenomenon	1,2
3	Viscosity and rheology	1,2,4,5
4	Dispersion system	1,2,5
5	Diffusion and dissolution	1,2,4
6	Kinetics and drug stability	1,2,5

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE2910
Course Name: Industry aligned learning -I
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
01	--	--	01	100	--	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To give idea to the students related to good manufacturing practices for manufacturing documentations, laboratory practices and engineering practices

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	Engineer's Role in Pharmaceutical Industry	05	50
Section II			
Module No.	Content	Hours	Weightage in %
2.	Good Practices for Pharmaceutical Industry like GXP: GMP/ GDP / GLP / GEP	10	50
	TOTAL	15	100

Reference Book(s):

Title	**Author/s**	**Publication**
ICH Guideline Q10	Global Society	Indian Press

Course Evaluation:
Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):
After the completion of the course, the students will be able to:

SEPE2910	**INDUSTRY ALIGNED LEARNING-I**
CO 1	Generate competency in accordance with current regulatory guidelines related to GMP
CO 2	Relate the basic concepts and fundamentals of pharmaceutical industry

CO 3	Implement various aspects of GDP
CO 4	Illustrate the concepts of GLP and GDP

Mapping of CO with PO

SEPE2910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1				1	3	2	1	2			1
CO 2	1				1	3	2		2			1
CO 3	1				1		1	1	1			
CO 4	1				1		1	1	1			

Mapping of CO with PSO

SEPE2910	PSO1	PSO2	PSO3
CO 1	3	1	
CO 2	3	3	1
CO 3	3	2	
CO 4	1	1	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Engineer's Role in Pharmaceutical Industry	1,2,3
2	Good Practices for Pharmaceutical Industry	1,2,3

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH2010
Course Name: Chemical Process Calculations
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	Total
03	--	01	04	40	60	--	--	50	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learner to

- know the conventions and the methods of chemical process.
- Develop the basic acumen for the Chemical Engineering and its calculations.
- know how to carry out various process calculations.
- improve their analytical skills for various chemical processes.
- improve their technical ability in the form of numerical analysis of chemical problems.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Chemical Engineering and Chemical Industry, Steady state and unsteady state processes, Unit Operations, Unit Processes and Process Flow Diagrams.	02	03
2.	**Graphics and Basics of Chemical Processes** Graphical methods of curve fittings, Method of least squares, Solution of cubic equations by trial-and-error method, Conversion of units, Dimensional analysis, Properties of gas, liquid and solid, Equations of state.	03	07
3.	**Basic Calculations** State properties: Molecular weight, Compositions, Density, Vapor pressure etc for gas, liquid and solid systems, Thermal properties: Heat capacity, Sensible heat, Latent heat, Heat of reaction, Heat of solution, Enthalpy calculations etc. for gas, liquid and solid systems, Techniques of problem Solution: Analytical, Graphical and Numerical, Gas laws and phase equilibria, Humidity, Saturation and Crystallization.	09	20

4.	**Material Balances** Materials balance: Concepts of limiting and excess reactants, Batch, Stage-wise, Continuous and recycle operations, Material balance of systems involving mixing, extraction, distillation, crystallization, chemical reaction and recycle processes, Material balance equations based on conservation principle, Material balances for non-reactive processes (Unit Operations), Material balances for reactive processes.	08	20
Section II			
Module No	Content	Hours	Weightage in %
5.	**Vapour pressure** Vapour pressure plots, Vapour pressure of immiscible liquids and vapour pressure of solutions; Humidity and saturation humidity chart, Super saturation, Distribution of a solute between immiscible and partially miscible liquids, Solubility of gases.	04	05
6.	**Thermo physics and Energy Balances** Energy balances for closed and open systems based on energy conservation principle, Energy balances for non-reactive processes (Unit Operations), Energy balances for reactive processes, Coupled material and energy balances for single unit process, Heats of formation, combustion, reaction, solution, dilution, Effect of temperature on heat of reaction, Energy balance of systems without and with chemical reactions, Heat capacity calculations, Enthalpy changes of reactions, dissolution and laws of thermochemistry, Effect of pressure and temperature on heat of reactions.	12	25
7.	**Multiple Unit Processes** Introduction to processes with multiple Units; Material balances on processes with recycle, Purge, and bypass, Introduction to DOF analysis and solution strategy for multi- unit process, Degrees of freedom in steady-state processes, Simultaneous material and energy balance problems using flow sheeting codes, Unsteady state material and energy balances.	07	20
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Stoichiometry	Bhatt, B.I. and Vora, S.M.	Tata McGraw-Hill Publishing Co., New Delhi.
Chemical Process Principles Part-I	Hougen, O.A., Watson. K.M. and Ragatz, R.A.	John Wiley & Sons, (CBS Publishers & Distributor, New Delhi).

Reference Book(s):

Title	Author/s	Publication
Basic Principles and Calculation in Chemical Engineering	Himmelblau, D.M.	Prentice Hall, Inc.
Introduction to Chemical Engineering	S K Ghoshal, S K Sanyal and S Dutta	Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

Conservation of Mass and Energy	Whitwell J.C. &Jone R.K.	McGraw-Hill, Singapore, 1973

Web Material Link(s):

- http://nptel.ac.in/courses/103103039/23

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Tutorial:

- Continuous Evaluation consists of performance of tutorial which should be evaluated out of 10 Marks for each tutorial and average of the same will be converted to 30 marks.
- Numerical Test consists of 10 marks.
- Internal Viva consists of 10 marks.

Course Outcome(s):

After the completion of the course, the students will be able to:

SECH2010	**CHEMICAL PROCESS CALCULATIONS**
CO 1	Apply the concept of dimension and unit conversion to check dimensional consistency of balanced equations and understand the specific terms used in process calculation.
CO 2	Compute material balance problems on distillation, absorption, etc without chemical reactions.
CO 3	Compute material balance problems on batch and continuous process with chemical reactions.
CO 4	Solve energy balance problems on heat exchanger, evaporator, etc of various unit processes.
CO 5	Solve problems related to ideal and real gas and liquid solutions.

Mapping of CO with PO

SECH2010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1										1
CO 2		1			1				1	1		1
CO 3				1					1	1		1
CO 4			1		1					1		1
CO 5	2	1		1	1					1		1

Mapping of CO with PSO

SECH2010	PSO1	PSO2	PSO3
CO 1		1	
CO 2	1	1	
CO 3		1	
CO 4	1	1	
CO 5	1	1	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction	1,2,5
2	Graphics and Basics of Chemical Processes	1,2,3,4,5
3	Basic Calculations	3,4,5
4	Material Balances	3,4,5
5	Vapour pressure	1,2,3,4,5
6	Thermo physics and Energy Balances	3,4,5
7	Multiple Unit Processes	3,4,5

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH2020
Course Name: Mechanical Operations

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	Total
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:

To help learner to

- Understand many basic principles of Chemical Engineering operations such as Size Reduction, Filtration, Sedimentation, Mixing and Agitation etc. and their mathematical co-relation.
- Understand basic principles of particle preparation and their characterization.
- Study various methods for storage of solids and conveyors available for their transportation.
- Understand the performance of different equipment for separation of solids and size reduction.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Properties of particulate solid** Introduction to particle technology, Characterization of solid particles, particle size measurement techniques, Mixed particles, specific surface of mixture, Particle population.	02	05
2.	**Size reduction and enlargement** Types of equipment and their studies, Principles of comminution, Laws of crushing and grinding, Closed and open circuit grinding, power requirements, Energy and power required for comminution, Industrial processes for particle size enlargement, size enlargement equipment comminution, Broad classification, Primary breaking operations, Intermediate crushing by crushers, cone, roll and impact crushers, Ball and fumbling mills—fine grinding, Determination of power consumption.	10	20
3.	**Properties of masses of solids** Storage of solids: Angle of repose, bulk storage, storage in bins and silos.	02	08

4.	**Conveying of solids** Codes for characterization of solids, screw conveyers, belt conveyers, bucket elevators, pneumatic conveying of solids, Design of conveyor belts, Mechanical and pneumatic conveying equipment and power consumption.	03	07
5.	**Screening - equipment and efficiency** Screen analysis, Method of reporting screen analysis, Capacity and effectiveness of screens, Screen analysis, sizing curves, industrial sizing, screening revolving and vibrating screens, Screen efficiency and capacity, Classification: Laws, wet and dry methods, Types of classifiers—stationary, mechanical, centrifugal and hydraulic.	05	10
	Section II		
Module No.	Content	Hours	Weightage in %
6.	**Filtration** Flow through porous media, Theories of filtration - Principles of filtration, constant rate and constant pressure filtration, Optimum cycle, compressible cakes and filter aids, constant pressure, constant rate filtration, compressible and incompressible cakes, cake resistance, filter media resistance, filter media, filter aids, filtration equipment (batch, continuous), selection criteria, washing of filter cakes, filtration by continuous vacuum and pressure filters.	06	15
7.	**Gravity setting and sedimentation** Gravity clarifiers, sorting clarifiers, Batch sedimentation, rate of sedimentation, Thickening process and sedimentation, Design of thickeners and clarifiers free and hindered setting, Centrifugal sedimentation: Principles of centrifugal sedimentation, Solid gas separation, liquid solid separation, Centrifugation.	05	10
8.	**Mixing** Mixing equipment and characteristics, power consumption and efficiency, mixing of powders and pastes: Mixers for cohesive and non-cohesive solids, Mixing Index Agitation and mixing of liquids: Basic stirred tank design, Types of impellers, flow patterns, power consumption and scale up.	06	10
9.	**Separators** Cyclones and electrostatic precipitator, Flotation, Thickeners, Flotation, Physico-chemical principles, Chemistry of flotation reagents and their functions, Flotation processes, Froth flotation machines, Concentration of copper, lead and zinc ores by flotation, Flotation of non-sulphide ores of copper and lead, dolomite, fluorspar, gypsum, phosphates, manganese, silica, sillimanite, graphite and coal, Electrical and magnetic	06	15

	concentration, Electrostatic and magnetic separations, dry and wet type separators.		
	TOTAL	45	100

List of Experiment:

Sr No	Experiment List	Hours
1.	Determination of particle size by sieve analysis.	02
2.	Determination of the optimum speed and critical speed of a ball mill.	02
3.	Measurement of different bulk properties of powder samples.	02
4.	To study powder compaction behavior using different powder compaction models.	02
5.	Study of particle size reduction by Roll crusher and Jaw crusher	04
6.	Characterization of powder flow ability by Angle of Repose.	04
7.	Obtaining the collection efficiency of cyclone	02
8.	Obtaining settling rates of slurry as function of solid concentration	02
9.	Power consumption in Agitated vessels	02
10.	Study of froth flotation process	02
11.	Study of Plate and Frame filter place	04
12.	Study of Centrifugation process	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Unit Operations of Chemical Engineering	W L McCabe and J C Smith	McGraw-Hill International
Principles of Mineral Dressing	A M Gaudin	Tata McGraw-Hill Publishing Co. Ltd., New Delhi
Elements of Ore Dressing	A F Taggart	John Wiley and Sons, New

Reference Book(s):

Title	Author/s	Publication
Chemical Engineering Vol.- II, 6th Ed.	J.M. Coulson & J.F. Richardson	Elsevier, 2003 or Pergamon Press
Unit Operations	G.G. Brown Ed.	John Wiley & Sons, 1950
Transport Processes and Separation Process Principles' 4th Ed,	C.G. Geankopolis	Prentice Hall India, 2003

Web Material Link(s):
http://nptel.ac.in/syllabus/103107091

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks

Practical:

- Continuous Evaluation consists of performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation of various topics consists of 15 marks during End Semester Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SECH2020	**MECHANICAL OPERATIONS**
CO 1	Apply and distinguish fluid particle systems and equipment.
CO 2	Select suitable size reduction equipment for solid solid separation method and conveying system.
CO 3	Describe and analyze agitation and mixing and their equipment.
CO 4	Classify solid liquid gas separation equipment. liquid gas separation equipment.

Mapping of CO with PO

SECH2020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	2	2	1		1			1	1	
CO 2	3	2	2	2	1		1			1	1	
CO 3	2	2	2	2	1		1			1	1	
CO 4	2	2	2	2	1		1			1	1	

Mapping of CO with PSO

SECH2020	PSO1	PSO2	PSO3
CO 1	2	2	
CO 2	2	2	
CO 3	2	2	
CO 4	2	2	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Properties of particulate solid	1
2	Size reduction and enlargement	1,2,3,4
3	Properties of masses of solids	1,2,4
4	Conveying of solids	1,3,4

5	Screening - equipment and efficiency	2,4,5
6	Filtration	2,4,5
7	Gravity setting and sedimentation	2,4,5
8	Mixing	2,4,5
9	Separators	2,4,5

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH2040
Course Name: Chemical Engineering Materials & Metallurgy

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	Total
02	--	--	02	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learner to

- identify the different chemicals and related materials and their properties.
- understand the microstructures, crystallography, defects, and phase diagrams of different materials.
- help the students to understand the process involved in chemical and mechanical testing of materials under certain conditions.
- make them aware about the advancements in the area of materials used in chemical and allied industries.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Engineering Materials** Classification of engineering materials, Engineering requirements from materials, Basics of crystals and their correlated properties, Factors that govern material selection for engineering applications, Micro and macro examination.	02	10
2.	**Structure and Imperfections in Crystals** Introduction, Unit cells and their lattice structure, coordination number, crystal structure of metals, Atomic packing factor, Crystallographic planes and directions, Polymorphism and Allotropy, Diffusion in solids, Imperfection in crystals and their types.	04	10
3.	**Ferrous metals and its Alloys** Iron and their alloys - Aluminium, copper, Zinc, lead, Nickel and their alloys with reference to the application in chemical industries. Phase Diagrams and Phase	06	15

	Transformation, TTT and CCT Diagrams. Iron-IronCarbide and Iron-carbon diagrams, Overview of different types of irons - Wrought iron Pig iron, Cast iron, White Cast Iron, Grey Cast Iron, Malleable Cast Iron and their properties and characteristics, deformation of metals, Types of steel like Chromium, Manganese, Molybdenum and Manganese steels.		
4.	**Metals: their behaviors and properties** Solidification of metals and an alloy, Nucleation and Growth, Solidification defects, Effects of Structure on Mechanical Properties, Methods to control the grain structure resulting from solidification, Cooling curve of pure metal and alloy, Deformation in polycrystalline materials, Mechanical testing of materials (destructive & non-destructive) testing methods.	03	15
	Section II		
Module No.	Content	Hours	Weightage in %
5.	**Polymers, Ceramics, and Composites:** Methods of fabrication of materials like timber, plastics, rubber, fibres and other polymeric materials, Ceramics, Ceramic Matrix, Crystalline and non-crystalline ceramic systems, Properties of ceramic materials, Glass and refractories, Cement refractories, Alumina, Zirconia, Silicon Carbide, Sialons, Reaction Bonded Silicon Nitride, Processing Composite materials, Fibre reinforced plastic (FRP), Organic materials like wood, plastics, and rubber, Advanced materials like Biomaterials and composites with special reference to the applications in chemical Industries, Polymers - Definition, Classification & characteristics, Types of polymerization, Polymer processing, Smart polymer, Advanced polymer Conductive polymer, bio-route prepared nano polymer, Blended polymer, self-cleaning polymer surfaces.	10	30
6.	**Nano materials** Metal and Semiconductor Nano materials, Quantum Dots, Wells and Wires, Molecule to bulk transitions, Bucky balls and Carbon Nano tubes, Nano composite, Molecular machines, Nanofactories, Nanocatalysts, Nanocomposites, Bio-analytical tools, Nano/micro arrays, Nano devices, lab- on-a-chip etc.	05	20
	TOTAL	30	100

Text Book(s):

Title	**Author/s**	**Publication**
Materials Science and Metallurgy	O. P. Khanna	Dhanpatrai Publication
Chemical Engineering Materials	Rumford F.	Constable and Company Limited, 2nd Edition, 1987
Membrane Separation Processes	Kaushik Nath	PHI Pvt. Ltd., 2008

Principles of Colloid and Surface Chemistry, 3rd Edn.	Hiemenz, P. C., and R. Rajgopalan	Marcel Dekker, NY, 1997.
Nano chemistry A chemical approach to nanomaterials	Ozin G. A, Andre C. Arsenault	Royal society of chemistry, UK,2005.

Reference Book(s):

Title	Author/s	Publication
Callister's Material Science and Engineering	R. Balasubramanian	Wiley India
Chemical Engineering Materials	Chaudhry H.	Indian Book Distributing Company, 2nd Edition, Delhi, 1982

Web Material Link(s):

- http://nptel.ac.in/downloads/113106032/

Course:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

After completion of the course, the students will be able to:

SECH2040	CHEMICAL ENGINEERING MATERIALS & METALLEURGY
CO 1	Identify crystal structure of various materials.
CO 2	Analyze microstructures, crystallography and defects of different chemical engineering materials and metals
CO 3	Classify the metallurgy of ferrous and nonferrous metals and alloys.
CO 4	Define the basics of polymers and composite material.

Mapping of CO with PO

SECH2040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1			3			3			1		
CO 2	1			1			3			3		
CO 3	1			2						3		
CO 4	1			1								

Mapping of CO with PSO

SECH2040	PSO1	PSO2	PSO3
CO 1	3	3	2
CO 2	3	3	3
CO 3			
CO 4			

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to Engineering Materials	1,2
2	Structure and Imperfections in Crystals	2,3
3	Ferrous metals and its Alloys	1,4
4	Metals: their behaviors and properties	2,3,4
5	Polymers, Ceramics, and Composites	1,2,3
6	Nano materials	3,5,6

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE2930
Course Name: Industrial Exposure
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
--	--	--	02	--	--	100	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective of the Course:

To help learners to

- get exposed to the industrial spectrum.
- learn the mechanisms of industry/ workplace.
- be aware about work culture and policies of industries.

Outline of the Course:

Sr. No	Content
1.	Selection of Companies
2.	Company Information collection
3.	Report Writing
4.	Presentation & Question-Answer

Course Evaluation:

Sr. No.	Evaluation criteria	Marks
1	Actual work carried & Report Submission	50
2	Final Presentation & Question-Answer session	50
TOTAL		100

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE2930	INDUSTRIAL EXPOSURE
CO 1	Construct company profile by compiling brief history, management structure, products/services offered, key achievements and market performance for the company visited during internship.
CO 2	Determine the challenges and future potential for his/her internship organization in particular and the sector in general.
CO 3	Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
CO 4	Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.
CO 5	Analyze the functioning of internship organization and recommend changes for improvement in processes.

Mapping of CO with PO

SEPE2930	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	3	3	3	3	3				0	3
CO 2	1	2	3	3	3	3	3				3	3
CO 3	1	2	3	3	3	3	3				3	0
CO 4	1	1	1				3				3	3
CO 5	1	1	2	3	3	3	3				0	3

Mapping of CO with PSO

SEPE2930	PSO1	PSO2	PSO3
CO 1			
CO 2	3	3	3
CO 3	3	3	3
CO 4			
CO 5		3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Selection of Companies	1,2,3,4
2	Company Information collection	1,2,3,4
3	Report Writing	1,2,3,4
4	Presentation & Question-Answer	1,2,3,4

Report Writing Guidelines

A. Report Format:

1. Title Page (to be provided by the respective supervisor)

The title page of the project shall give the following information in the order listed:

- Full title of the project as approved by the Mentor;
- The full name of the student/Group of students with enrollment number;
- The qualification for which the project is submitted;
- The name of the institution to which the project is submitted;
- The month and year of submission.

2. Project Certification Form
   [The form should be duly filled signed by the supervisors.]
3. Acknowledgements
   [All persons (e.g. supervisor, technician, friends, and relatives) and organization/authorities who/which have helped in the preparation of the report shall be acknowledged.]
4. Table of Contents/Index with page numbering
5. List of Tables, Figures, Schemes
6. Summary/abstract of the report.
7. Introduction/Objectives of the identified problem
8. Data Analysis and Finding of Solution
9. Application of the identified solution
10. Future Scope of enhancement of the Project and Conclusion
11. "Learning during Project Work", i.e. "Experience of Journey during Project Duration"

12. References(must)
13. Bibliography
14. Annexures (if any)

B. Guideline for Report Formatting:

- Use A4 size page with 1" margin all sides
- Header should include Project title and footer should contain page number and enrollment numbers
- Chapter Name should be of Cambria font, 20 points, Bold
- Main Heading should be of Cambria font, 14 points, Bold
- Sub Heading should be of Cambria font, 12 points, Bold
- Sub Heading of sub heading should be of Cambria font, 12 points, Bold, Italic
- Paragraph should be of Cambria font, 12 points, no margin at the start of the paragraph

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE2040
Course Name: General Pharmacology I
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To know in detail the classification, therapeutic use
- To know cardiovascular system
- To know urinary system and respiratory system

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to pharmacology** Sources of drugs, dosage forms and routes of drug administration, mechanism of action of drugs. Combined effect of drugs, factors modifying drug action, tolerance and dependence. Absorption, Distribution, Metabolism and Excretion of drugs. Principles of basic and clinical pharmacokinetics. Adverse drug reactions. Drug interactions, Bioassay of drugs and biological standardisation, Overview of drug discovery and development.	08	20
2.	**Pharmacology of peripheral nervous system** Sympathomimetics, sympatholytics, adrenergic receptor and neuron blocking agents, ganglionic agonists and antagonists agents, neuromuscular blocking agents, local anaesthetic agents.	06	15
3.	**Pharmacology of central nervous system** Nerve conduction and transmission in the C.N.S, general anaesthetics, sedatives, hypnotics, anti-anxiety agents and centrally acting muscle relaxants, Psychopharmacological agents – Antipsychotics, antidepressants, neuroleptics, anti-maniacs and hallucinogens, thymoleptics, antiepileptic drugs, Anti-parkinsonism drugs, analgesics, antipyretics, anti-inflammatory (NSIADs) and anti-gout drugs, narcotic analgesics and antagonists, C.N.S. stimulants, drug addiction and drug abuse.	08	15
Section II			

Module No.	Content	Hours	Weightage in %
4.	**Pharmacology of cardiovascular system** Cardiac glycosides, anti-hypertensive drugs, anti-anginal and vasodilator drugs including calcium channel blockers and beta adrenergic antagonists, Anti-arrhythmic drugs, antihyperlipidemic drugs, Drugs used in the therapy of shock	12	25
5.	**Pharmacology of urinary system and respiratory system** Fluid and electrolyte balance, Diuretics and Anti-diuretics, Anti-asthmatic drugs including bronchodilators, leukotriene inhibitors, anti-tussives and expectorants, Respiratory stimulants.	11	25
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Basic & Clinical Pharmacology,	Katzung, B.G.	P rentice Hall, International,11th edition, McGraw-hill, 2009.
Essentials of Medical Pharmacology	Tripathi, K.D	Jay Pee Publishers, New Delhi,7th

Reference Book(s):

Title	Author/s	Publication
"Biotherapeutic Agents and Infectious Diseases",	Elmer, G.W.	Humana Press, 1999.
Pharmacology	Rang, H.P.	5th Edition, Churchill Liningstone / Elsevier, 2003.

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE2040	GENERAL PHARMACOLOGY-I
CO 1	Discuss, what drugs do to the living organisms and how their effects can beapplied to therapeutics.
CO 2	Knowledge of drugs like sources, physico chemical properties, mechanism of action, physiological and biochemical effects.
CO 3	Establish the knowledge of absorption, distribution, metabolism and excretion along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.
CO 4	Explain the pharmacology of drugs acting on Central Nervous System.

Mapping of CO with PO

SEPE2040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1			1	1	3		1	2	1		
CO 2	1			1	1	3		3	2	2		
CO 3									1	1		1
CO 4				2	1	2			2	2		1

Mapping of CO with PSO

SEPE2040	PSO1	PSO2	PSO3
CO 1	3	1	1
CO 2	3	1	2
CO 3	2	1	2
CO 4	1	1	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to pharmacology	1,2
2	Pharmacology of peripheral nervous system	1,2,4
3	Pharmacology of central nervous system	2,4
4	Pharmacology of cardiovascular system	2,4
5	Pharmacology of urinary system and respiratory system	1,2,4

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE2050
Course Name: Molecular Biology and Genetic Engineering
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
04	02	--	05	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To provide the molecular processes of DNA replication
- To provide the basic concepts of protein and nucleic acid structure

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Cell structure and function of the organelles** Prokaryotic, Eukaryotic cells, Sub-cellular organelles and functions. Principles of membrane organization membrane proteins, cytoskeletal proteins. Extra cellular matrix, cell-cell junctions, various types of transport across cell membrane.	08	10
2.	**Cell division, cancer and immortalization** Cell cycle – Mitosis, Meiosis, Molecules controlling cell cycle, cancer, role of Ras and Raf in oncogenesis and apoptosis. Stem cells, immortalization of cells and its applications	07	15
3.	**Chemistry of nucleic acids** Introduction to nucleic acids: Nucleic acids as genetic material, Structure and physicochemical properties of elements in DNA and RNA, Biological significance of differences in DNA and RNA. Primary structure of DNA: Chemical and structural qualities of 3',5'-Phosphodiester bond. Secondary Structure of DNA: Watson & Crick model, Chargaff's rule, X–ray diffraction analysis of DNA, Forces stabilizes DNA structure, Conformational variants of double helical DNA, Hogsteen base pairing, Triple helix, Quadruple helix, Reversible denaturation and hyperchromic effect. Tertiary structure of DNA: DNA supercoiling.	15	25
Section II			
Module No.	Content	Hours	Weightage in %

4.	**DNA replication** Overview of Central dogma. Organization of prokaryotic and eukaryotic chromosomes. DNA replication: Meselson & Stahl experiment, bi–directional DNA replication, Okazaki fragments, Proteomics of DNA replication, Fidelity of DNA replication, Inhibitors of DNA replication, Overview of differences in prokaryotic and eukaryotic DNA replication, Telomere replication in eukaryotes.	10	10
5.	**Transcription** Structure and function of mRNA, rRNA and tRNA. Characteristics of promoter and enhancer sequences. RNA synthesis: Initiation, elongation and termination of RNA synthesis, Proteomics of RNA synthesis, Fidelity of RNA synthesis, Inhibitors of transcription, Differences in prokaryotic and eukaryotic transcription. Basic concepts in RNA world: Ribozymes, RNA processing: 5'- Capping, Splicing-Alternative splicing, Poly 'A' tail addition and base modification.	10	20
6.	**Translation** Introduction to Genetic code: Elucidation of genetic code, Codon degeneracy, Wobble hypothesis and its importance, Prokaryotic and eukaryotic ribosomes. Steps in translation: Initiation, Elongation and termination of protein synthesis. Inhibitors of protein synthesis. Post-translational modifications and its importance.	10	20
	TOTAL	60	100

List of Experiments

S.no	**Experiment list**	**Hours**
1	Isolation of total and plasmid DNA from bacteria.	04
2	Isolation of total DNA from plant and animal cells/tissues.	04
3	Restriction enzyme digestion of DNA.	04
4	Agarose gel electrophoresis of nucleic acids.	04
5	Elution of DNA from Agarose gels.	04
6	Polymerase Chain Reaction [PCR].	04
7	Induction of recombinant protein expression	04
8	Western blotting.	02
	TOTAL	30

Text Book(s):

Title	**Author/s**	**Publication**
"Molecular Biology"	Friefelder, David,	2nd Edition, Narosa Publishing House,1999.
"Molecular Biology",	Weaver, R.F.	3rd Edition, McGraw Hill, 2005.

Reference Book(s):

Title	**Author/s**	**Publication**
"Molecular Biology of the Gene	Waston, J.D.	5th Edition, Pearson Education,

		2004.
"Molecular Biology and Biotechnology	Walker, J.M. and R. Rapley	4th Edition, Panima, 2002.

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE2050	**MOLECULAR BIOLOGY & GENETIC ENGINEERING**
CO 1	Identify the various levels of gene regulation and protein function including signal transduction and cell cycle control.
CO 2	Interpret the outcome of experiments that involve the use of recombinant DNA technology and other common gene analysis techniques.
CO 3	Relate properties of cancerous cells to mutational changes in gene function.
CO 4	Execute various experiments commonly involved in molecular biology research.
CO 5	Impart detailed understanding of transcription and translation.

Mapping of CO with PO

SEPE2050	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		1		2	1			1	1	1		-
CO 2		1		2	1				3	1		1
CO 3				1	1				1	1		
CO 4		1		1	1			1	2	3		
CO 5				1	1							

Mapping of CO with PSO

SEPE2050	PSO1	PSO2	PSO3
CO 1	1		1
CO 2	1	1	1
CO 3	2	2	2
CO 4	1	1	1
CO 5	1	1	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Cell structure and function of the organelles	1,2
2	Cell division, cancer and immortalization	2,4
3	Chemistry of nucleic acids	2,4,5
4	DNA replication	2,3,4,5

5	Transcription	1,2
6	Translation	2,4

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE2920
Course Name: Industry aligned learning -II

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
02	--	--	02	100	--	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To deliver knowledge regarding effluents generated during manufacturing and idea of equipment's used for the treatment of effluent
- Management of water to control waste of water and control aqueous effluent
- To deliver knowledge regarding different vacuum system and energy conservation

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	Water Management with respect to Zero Discharge in Pharmaceutical Industry	05	20
2.	Energy Conservation measures required for Pharmaceutical Industry	10	30
Section II			
Module No.	Content	Hours	Weightage in %
3.	Introduction to Effluent Treatment Plant, Scrubber system, Multi Effect Evaporation system etc.	10	30
4.	Different kinds of Vacuum system	05	20
	TOTAL	30	100

Text Book(s):

Title	**Author/s**	**Publication**
Waste water treatment	M N Rao	Mc Grill

Course Evaluation:
Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE2920	INDUSTRY ALIGNED LEARNING-II
CO 1	Acquire knowledge regarding effluent treatment and controlling quantity of water through proper management system.
CO 2	Ability to identify different kinds of vacuum system.
CO 3	Knowledge to established energy conservation in pharmaceutical industry.
CO 4	Identify various scribing systems, multi effect evaporators and drying system.

Mapping of CO with PO

SEPE2920	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1				1	3	2	1	2			1
CO 2	1				1	3	2	-	2			1
CO 3	1				1		1	1	1			-
CO 4	2				1				1			

Mapping of CO with PSO

SEPE2920	PSO1	PSO2	PSO3
CO 1	3	1	
CO 2	3	3	1
CO 3	3	2	
CO 4	2	1	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Water management	1,2,4
2	Effluent Treatment Plant	1,2,3,4
3	Energy Conservation	1,2,3
4	Vacuum system	1,2,4

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH2050
Course Name: Fluid Flow Operations
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	Total
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learner to

- get the introductory idea and explanation of basic fundamentals of Fluid Flow Operations which is used in the applications of chemical engineering, Porous media movement, Aerodynamics, hydraulics, Marine Engineering, Gas dynamics etc.
- learn Fluid Properties.
- understand the importance of flow measurement and its applications in Industries and to obtain the loss of flow in a flow system.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Basic Concept and Fluid statics & its application** Scope and Applications of fluid flow, Properties of fluids such as Density, viscosity, surface tension, capillarity effect, vapour pressure. **Nature of fluids:** Incompressible and compressible fluids, Pressure concepts, Force and Pressure, Pascal's law of Pressure at a point, Pressure measurement by Manometers – U tube, Inclined U tube and Differential, Centre of Pressure, Hydrostatic equilibrium in gravitational and centrifugal field, Hydrostatic forces on surface – Vertical, Horizontal and Inclined, Forces on curved Surfaces, Buoyancy and Buoyant Force, Centre of Buoyancy and Metacenters, Determination of Metacentric Height, Stability of Floating and Submerged Body, Position of metacenter relative to Centre ofbuoyancy. Manometers, Inclined manometer, Continuous gravity ad centrifugal decanter.	08	15

2.	**Boundary layers & its applications** Concept of Boundary Layer, Boundary layer Thickness, Momentum Thickness, Displacement Thickness, Drag and Lift, Separation of Boundary layer, Streamlined and Bluffed Bodies	04	10
3.	**Kinematics of fluid flow** Types of fluid flow namely steady and unsteady, Uniform and non- uniform, laminar and turbulent, compressible and incompressible internal and external, one, two-dimensional flow. Newton's Law of Viscosity, Rheological behavior of fluid, capillary viscometer.	04	10
4.	**Basic fluid equations & fluid dynamics** Bernoulli's equation Euler's Equation, Modified Bernoulli's equation. Major and Minor losses, Equivalent length, flow through pipe in series, parallel, pipe network Application Venturimeter: Horizontal andinclined, Orifice meter, Pitot tube Notches and Weirs: Introduction, classification, Derivation for V – notch, Rectangular notch	06	15
Section II			
Module No.	Content	Hours	Weightage in %
5.	**Flow of compressible fluids and its applications** Introduction to compressible flow, flow through pipes, Pipe fitting. Valves, nozzles, Fans, Blowers ejectors and compressors; Continuity equations, Velocity of sound, Stagnation temperature, Processes of compressible flow.	07	15
6.	**Flow of Fluids through Solids** Form drag - skin drag - Drag coefficient. Flow around solids and packed beds. Friction factor for packed beds. Ergun's Equation - Motion of particles through fluids - Motion under gravitational and centrifugal fields - Terminal settling velocity. Fluidization - Mechanism, types, general properties – applications	08	15
7.	**Transportation** Classification and types, Centrifugal pumps – Construction and working, Power required, Definitions of heads and efficiency, NPSH, Priming, Cavitations, characteristic curves. Specific speed, minimum speed.	08	20

	Reciprocating Pump: Classifications and working. Power Consumption in Agitation: Power curves, Power No., types of impellers. Introduction to Compressors, Fans and Blowers. Types of Valves: Globe valves, Gate valves, butterfly valves and non – Return valves.		
	TOTAL	45	100

List of Experiment:

Sr No	Experiment List	Hours
1.	Determine metacentric height of floating body.	02
2.	Measurement of pressure using different types of manometers.	04
3.	Determine Co-efficient of Discharge by venturimeter, Orificemeter and Rotameter.	04
4.	Verification of Bernoulli's apparatus.	02
5.	Measurement of velocity of flow using Pitot tube.	02
6.	Measurement of Friction factor for Different pipes & annulus.	02
7.	Measurement of viscosity using Redwood Viscometer.	02
8.	Determine discharge through triangular/trapezoidal / rectangular notch.	02
9.	Determine different flow patterns by Reynolds's apparatus.	02
10.	Measurement of lift and drag of aerofoil.	02
11.	Measurement of static pressure distribution around aerofoil using wind tunnel.	02
12.	Experiment on viscosity by stoke's law	02
13.	Experiments on characteristics of centrifugal pumps	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Textbook of Fluid Mechanics and Hydraulic Machines	R. K. Bansal	Laxmi Publications
Introduction to Fluid Mechanics and Fluid Machines	S.K. Som & G Biswas.	Tata McGraw Hill Publication
Unit Operations of Chemical Engineering	McCabe W.L., Smith J.C., Harriott P.	McGraw Hill

Reference Book(s):

Title	Author/s	Publication
Fluid Mechanics	Frank M. White	Tata McGraw Hill Publication
Fluid Mechanics	R.K. Rajput	Schand Publication
Fluid Mechanics for Chemical Engineers	De Nevers N	McGraw-Hill

Web Material Link(s):

- http://nptel.ac.in/courses/112105171/1

Course:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical/Tutorial:

- Continuous Evaluation consists of performance of Practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation of various topics consists of 15 marks during End Semester Exam.

Course Outcome(s)

After the completion of the course, the students will be able to:

SECH2050	FLUID FLOW OPERATIONS
CO 1	Understand fundamentals of fluids and its types.
CO 2	Analyze various flow problems and flow characteristics for various flow conditions
CO 3	Demonstrate working of different flowmeters.
CO 4	Determine major and minor losses through different pipes fittings.
CO 5	Evaluation of pump performance

Mapping of CO with PO

SECH2050	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1							2		1
CO 2	2	1	1									
CO 3	1	1	1									
CO 4	1	1										
CO 5		1		1								

Mapping of CO with PSO

SECH2050	PSO1	PSO2	PSO3
CO 1	1		
CO 2	1	1	1
CO 3	2	1	
CO 4		3	
CO 5		1	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Basic Concept and Fluid statics & its application	1,2
2	Boundary layers & its applications	2,4
3	Kinematics of fluid flow	2,3,4
4	Basic fluid equations & fluid dynamics	1,2
5	Flow of compressible fluids and its applications	1,2,4,5
6	Flow of Fluids through Solids	2,3,4
7	Transportation	3,4,5

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH2061
Course Name: Physical Inorganic and Analytical Chemistry
Prerequisite Course(s): SESH1220 – Chemistry

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	Total
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learner to

- Provide the basic knowledge of physical, inorganic and analytical chemistry to students in the context of industrial need to make a good foundation in Chemistry which will help to the students in their self-development and to cope up with industries need.
- Understand the basics of different chemistry
- Make them aware about various analytical techniques used for the analysis of chemical substances
- Use physical chemistry and its theoretical principles and experimental techniques to investigate the chemical transformations and Physical changes accompanying them.
- Make them aware about the inorganic chemistry and its qualitative analysis.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Properties of Liquid and preparation of solution** Define the terms: Solute, Solvent and Solution, Different standards of solutions like Primary standards and Secondary standards, Definition and different methods of expressing concentration, Definition of the Surface tension, Parachor, Refractive index, Molar refraction, Specific refraction, Viscosity.	02	04
2.	**Electro analytical techniques for analysis** Basic concepts, Standard reduction potentials, Measurement of overall redox reaction tendency, Introduction to Potentiometry, Electrodes (Reference electrode, Saturated calomel reference electrode, indicator electrode, pH electrode), potentiometric titration, Karl Fischer titration (End point detection, The coulometric method)	06	14

3.	**Phase Rule** Introduction, Phase Rule and its merits and demerits, Phase diagrams of single component systems (H_2O and Sulphur), two component systems involving eutectic systems (Pb-Ag, Sn-Mg), Applications.	03	07
4.	**Nuclear Chemistry** Basic terms and concepts, Types of nuclear reactions, Nuclear fission and fusion, nuclear reactors, radiation measurements (Detectors- Gas ionization detectors- principle, Ion chambers- proportional counter, G.M. Counter-scintillation detector- principle, features, Inorganic & organic scintillators, solid state detectors), disposal of nuclear waste.	05	11
5.	**Emerging Trends in Green Chemistry** Introduction to Green Chemistry, Twelve principles of Green Chemistry with examples, Designing a Green Synthesis, Example of green synthesis (adipic acid, catechol, Methyl Methacrylate).	02	04
6.	**Microscopy Techniques** Principles, Instrumentation, Analysis of images/artifacts, Applications, AFM (Atomic force microscopy), SEM (Scanning electron microscope), TEM (Transmission electron microscopy), FTIR.	04	10
	Section II		
Module No.	Content	Hours	Weightage in %
7.	**Corrosion and its Control** Introduction and theories of corrosion, Dry corrosion (chemical), Wet corrosion (electrochemical), Bio corrosion, Mechanism of corrosion, Factors influencing corrosion (ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature), Corrosion control and prevention methods, corrosion inhibitors, cathodic and anodic protection and Electroplating. Protective coatings, chemical principles involved, boiler corrosion, inter granular corrosions.	07	17
8.	**Instrumental Methods of Chemical Analysis: Spectroscopic methods** Basic concepts, Instrumentation, Interpretation of data and relevant applications, Ultraviolet spectroscopy (UV), Infrared spectroscopy (IR), Nuclear Magnetic Resonance (NMR), Mass Spectrometry.	06	13
9.	**Thermal methods of analysis** TGA, DTA, DSC (Principle, Instrumentation, Quantitative aspects of curves and/or Interpretation of curves, Applications)	05	10

10.	**Separation Techniques** Principle, Instrumentation, selection of column and its specifications, applications and Limitations, Planar Chromatography (Paper chromatography, Thin Layer Chromatography), Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC)	05	10
	TOTAL	45	100

List of Experiment:

Sr. No.	Experiment List	Hours
1.	To determine the strength of the given Hydrochloric acid by Sodium hydroxide conduct metrically.	04
2.	To synthesize Chrome Alum.	04
3.	To determine λmax and concentration of unknown solution of $KMnO_4$ in 2N H_2SO_4 using Colorimeter.	04
4.	Determine the amount of Ba^{2+} as $BaSO_4$ in a salt solution.	04
5.	To investigate the reaction between $K_2S_2O_8$ and KI.	04
6.	Conductometric titration of strong acid vs. strong base.	04
7.	Determination of dissociation constant of weak acid by pH metric method.	04
8.	Determination of cloud point of a surfactant in the presence of salts.	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Text Book of Engineering Chemistry	Chawla S.	Dhanpat Rai & Co. Pvt. Ltd., Delhi, 2003.
Engineering Chemistry	Sharma B. K.	Krishna Prakashan Media (P) Ltd, Meerut.,2001
Instrumental Methods of Chemical Analysis	Ewing G. W.	Tata-McGraw Hill., New Delhi, 2001.

Reference Book(s):

Title	Author/s	Publication
Analytical Chemistry for Technicians (4^{th} edition)	John Kenkel	CRC Press, Taylor & Francis Group
Corrosion Engineering Principles and Practice	Pierre R. Roberge	The McGraw-Hill Companies
New-Trends-in-Green-Chemistry	V. K. Ahluwalia, M.Kidwai	Kluwer Academic Publishers, Boston Dordrecht London & Anamaya Publishers, New Delhi

Web Material Link(s):
http://nptel.ac.in/courses/105104148/

Course:
Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical/Tutorial:

- Continuous Evaluation consists of performance of Practical which should be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):
After the completion of the course, the students will be able to:

SECH2061	**PHYSICAL INORGANIC & ANALYTIC CHEMISTRY**
CO 1	Describe the basics of different chemistries used in chemical industries.
CO 2	Assess the theoretical and practical knowledge about modern analytical techniques and its quantitative analysis.
CO 3	Predict and apply the analytical tools used in research laboratories.
CO 4	Evaluate fundamentals of electrochemistry and recognize the electrochemical processes.
CO 5	Identify and define various types of nuclear changes or processes including fission, fusion and decay reactions.

Mapping of CO with PO

SECH2061	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	1	1	-	3				2		3
CO 2	3	3	2	3	-	3				1		3
CO 3	3	3	3	3	3	3				1		3
CO 4	3	3	2	2	3	3				3		3
CO 5	3	3		2	3	3				3		3

Mapping of CO with PSO

SECH2061	PSO1	PSO2	PSO3
CO 1	3		1
CO 2	3		2
CO 3	3		3
CO 4	3		3
CO 5	3		3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Properties of Liquid and preparation of solution	1,2
2	Electro analytical techniques for analysis	1,3
3	Phase Rule	2,5
4	Nuclear Chemistry	1,2,3
5	Emerging Trends in Green Chemistry	1,2,5
6	Microscopy Techniques	2,5
7	Corrosion and its Control	2,3,4
8	Instrumental Methods Of Chemical Analysis: Spectroscopic methods	4,5
9	Thermal methods of analysis	2,4,5
10	Separation Techniques	2,4,5

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH2070
Course Name: Chemical Engineering Thermodynamics-I
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
				Theory		Practical		Tutorial		
Theory	Practical	Tutorial	Credit	CE	ESE	CE	ESE	CE	ESE	Total
03	--	02	05	40	60	--	--	50	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help the learners to

- understand and appreciate thermodynamics as applied to various Chemical Engineering Processes.
- avail practical experience on the principles, viz., thermodynamic laws, Solution thermodynamics, Phase equilibrium and reaction equilibrium.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to the laws of Thermodynamics** Concept of Equilibrium, Entropy & Gibbs Free Energy, Laws of Thermodynamics (Open and Closed Systems) and Equations of Change (dU, dH, dA, dG).	07	10
2.	**Properties of pure fluids** PVT behavior including EOS for mixtures; Fugacity estimation/ calculations based on PVT behavior, Heat effects accompanying chemical Reactions. Phase equilibrium criteria and VLE calculations for different pressure ranges including flash calculations.	07	15
3.	**Estimation of VLE data** Fugacity, Fugacity Coefficient, Activity, Activity Coefficient, Activity coefficient calculation from experimental VLE data and data reduction, applications of Gibbs-Duhem relation for calculations of and consistency check for VLE data.	05	10
4.	**Phase Diagrams in Thermodynamics** Phase diagrams for miscible, partially miscible and immiscible liquid mixtures, introduction to LLE and VLLE calculations.		
	Section II		

Module No.	Content	Hours	Weightage in %
5.	**Thermodynamic Properties of Solutions** Introduction to fugacity and activity, Activity Coefficients- Partial molar properties- miscible system, immiscible system, Chemical potential as a partial molar property-Lewis randall rule-Roults and Henry's law-Gibbs Duhem Equation Mathematical relation among thermodynamic functions, Maxwell's relations, Interrelation between H, S, U, G, C_p, C_v, properties of single- and two-phase system. Types of thermodynamic diagrams. Partially immiscible system, testing of vapor-liquid equilibrium data, Van Laar equation. Margules equation, Redlich-Kister equation, P-X-Y, T-X-Y, & X-Y Diagram, vapor-liquid equilibrium of ideal and non-ideal solution	15	30
6.	**Refrigeration and liquefaction** Carnot refrigerator, Vapour compression cycle, Absorption refrigeration, Choice of refrigerant, Heat pump, Liquefaction processes.	08	20
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Introduction to Engineering Thermodynamics	J.M. Smith, Hendrick Van Ness, Michael M. Abbott,	McGraw Hill, New York, 2005.
Chemical Engineering Thermodynamics	S. Sundaram	Ahuja Publishers, New Delhi, 2001
A Textbook of Chemical Engineering Thermodynamics	K.V. Narayanan	PHI Learning, 2004

Reference Book(s):

Title	Author/s	Publication
Chemical Engineering Thermodynamics	B.F. Dodge	McGraw Hill, New York, 1971.
Chemical Engineering Thermodynamics	Y.V.C. Rao	Universities Press (1997)
Chemical Process Thermodynamics 3rd Ed,	B.G. Kyle	Prentice Hall India, 1994
Chemical Process Principles Part II	Hougen, O.A., Watson, K.M., and Ragatz, R.A.	John Wiley & Sons, (CBS Publishers & Distributors, New Delhi).

Web Material Links:

- http://nptel.ac.in/courses/103106070/

Course: Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.

- End Semester Examination consists of 60 marks.

Practical/Tutorial:

- Continuous Evaluation consists of performance of Tutorial which should be evaluated out of 10 marks for each Tutorial and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation of various topics consists of 15 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SECH2070	**CHEMICAL ENGINEERING THERMODYNAMICS-I**
CO 1	Relate the terminology associated with engineering thermodynamics.
CO 2	Evaluate changes in different thermodynamic properties for pure fluids using eos.
CO 3	Correlate experimental vle data of pure component and ideal mixtures with suitable equations.
CO 4	Calculate feasibility of reaction, heat of reaction, extent of reaction & equilibrium composition.
CO 5	Construct to devise a technically feasible refrigerator for wide applications.

Mapping of CO with PO

SECH2070	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1				2					1	
CO 2	2					2						
CO 3	2	1				2					2	
CO 4	3	1				2					2	
CO 5	2	1				2						

Mapping of CO with PSO

SECH2070	PSO1	PSO2	PSO3
CO 1			
CO 2		1	
CO 3		2	
CO 4		2	
CO 5		1	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction to the laws of Thermodynamics	1,2
2	Properties of pure fluids	2,3
3	Estimation of VLE data	3,4,5
4	Phase Diagrams in Thermodynamics	4
5	Thermodynamic Properties of Solutions	4,5,6
6	Refrigeration and liquefaction	5,6

THIRD YEAR B. TECH.

P P SAVANI UNIVERSITY

SCHOOL OF ENGINEERING

TEACHING & EXAMINATION SCHEME FOR B.TECH. PHARMACEUTICAL ENGINEERING PROGRAMME AY: 2021-22

Sem	Course Code	Course Name	Offered by	Teaching Scheme					Examination Scheme						
				Contact Hours				Credit	Theory		Practical		Tutorial		Total
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE	
5	SEPE3010	Industrial Pharmacy	PE	3	2	0	5	4	40	60	20	30	0	0	150
	SEPE3021	General	PE	4	2	0	6	5	40	60	20	30	0	0	150
	SEPE3030	Medicinal Chemistry	PE	3	2	0	5	4	40	60	20	30	0	0	150
	SEPE3910	Industry Aligned	PE	3	0	0	3	3	100	0	0	0	0	0	100
	CFLS3021	Foreign Language-II	CFLS	2	0	0	2	2	40	60	0	0	0	0	100
	SEPD3050	Integrated Personality	SEPD	2	0	0	2	1	100	0	0	0	0	0	100
	SEPE3930	Summer Training	PE	4			0	4	0	0		0	0	0	100
		Elective-I	CH	3	0	0	3	3	40	60	0	0	0	0	100
		Total					**26**	**26**							**950**
6	SEPE3040	Chemistry of Natural	PE	3	0	0	3	3	40	60	0	0	0	0	100
	SEPE3050	Technology of Solid	PE	3	2	0	5	4	40	60	20	30	0	0	150
	SEPE3060	Quality Control & Quality Assurance – Instrumentation & Validation	PE	3	0	0	3	3	40	60	0	0	0	0	100
	SEPE3920	Industry Aligned	PE	3	0	0	3	3	100	0	0	0	0	0	100
	SECH3052	Chemical Reaction	CH	3	2	0	5	4	40	60	20	30	0	0	150
	SEPE3490	Online NPTEL Course		3	0	0	3	3	100	0	0	0	0	0	100
	SEPD3020	Corporate Grooming & Etiquette	SEPD	1	2	0	3	2	0	0	5	5	0	0	100
		Total					**25**	**22**							**800**

Elective Courses																
Offered from Sem.	Course Code	Course Name	Offered By	Teaching Scheme					Examination Scheme							
				Contact Hours				Credit	Theory		Practical		Tutorial		Total	
				Theory	Practical	Tutorial	Total		CE	ESE	CE	ESE	CE	ESE		
5	SECH3510	Pharma Technology – API & Formulation	CH	3	0	0	3	3	40	60	0	0	0	0	100	
	SECH3520	Process Auxiliaries & Utilities in Allied Industries	CH	3	0	0	3	3	40	60	0	0	0	0	100	
	SECH3530	Air Pollution & Control	CH	3	0	0	3	3	40	60	0	0	0	0	100	
	SECH3540	Polymer Science & Technology	CH	3	0	0	3	3	40	60	0	0	0	0	100	

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3010
Course Name: Industrial Pharmacy
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

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

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Preformulation Studies:** Introduction to preformulation, 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, racemisation, polymerization BCS classification of drugs & its significant Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.	07	20
2.	**Tablets:** a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling. b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. c. Quality control tests: In process and finished product tests	08	15
3.	**Capsules:** a. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality	07	15

	control tests for capsules. b. Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Parenteral Products:** a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity. b. Production procedure, production facilities and controls, aseptic processing c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products. d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.	10	20
5.	**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.	06	15
6.	**Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.	07	15
	TOTAL	45	30

List of Experiments

S.no	Experiment list	Hours
1	Preformulation studies on paracetamol/asparin/or any other drug	04
2	Preparation and evaluation of Paracetamol tablets	04
3	Preparation and evaluation of Aspirin tablets	03
4	Coating of tablets- film coating of tables/granules	02
5	Preparation and evaluation of Tetracycline capsules	03
6	Preparation of Calcium Gluconate injection	02
7	Preparation of Ascorbic Acid injection	03
8	Qulaity control test of (as per IP) marketed tablets and capsules	03
9	Preparation of Eye drops/ and Eye ointments	03
10	Preparation of Creams (cold / vanishing cream)	03
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Drug stability - Principles and practice	Cartensen & C.J. Rhodes	3rd Edition, Marcel Dekker Series, Vol 107.

Reference Book(s):

Title	Author/s	Publication
Pharmaceutical dosage form disperse system VOL-1	Liberman & Lachman	Prentice Hall

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE3010	INDUSTRIAL PHARMACY
CO 1	Outline the objectives and applications of preformulation studies in the development and stability of dosage forms.
CO 2	Discuss the formulation, manufacturing, coating and quality control tests of tablets.
CO 3	Review the formulation and manufacturing considerations of liquid orals.
CO 4	Illustrate the pharmaceutical aspects of capsules and pellets.
CO 5	Describe the preparation and quality control of parenteral and ophthalmic preparations.

Mapping of CO with PO

SEPE3010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	2	2	1		3	1	3	2	2	2
CO 2	2	2	1	1	1		1	1	2	1	2	2
CO 3	1	2	2	1	1		2	1	2	1	1	1
CO 4	2	2	2	2	3	2	2	1	2	2	2	3
CO 5	2	2	2	2	1	2	2	1	2	1	2	1

Mapping of CO with PSO

SEPE3010	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	2		
CO 3	2	2	
CO 4	1	3	3
CO 5	3	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Preformulation Studies	1,2
2	Tablets	1,2,3
3	Capsules	1,3
4	Parenteral Products	1,2
5	Cosmetics	1,3,2
6	Pharmaceutical Aerosols	1,2

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3021
Course Name: General Pharmacology II
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
04	02	--	05	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Understand fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and Contraindications) of drugs.
- Understand mechanism of drugs acting on different systems of body.
- Emphasis on the basic concepts of bioassay.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Pharmacology of drugs acting on cardio vascular system** Introduction to hemodynamic and electrophysiology of heart, Drugs used in congestive heart failure, Drugs used in congestive heart failure, Anti-hypertensive drugs, Anti-anginal drugs, Anti-arrhythmic drugs, Anti-hyperlipidemic drugs	08	10
2.	**Pharmacology of drugs acting on cardio vascular system** Drug used in the therapy of shock, Hematinics, coagulants and anticoagulants, Fibrinolytics and anti-platelet drugs, Plasma volume expanders	07	15
3.	**Pharmacology of drugs acting on urinary system** Diuretics Anti-diuretics, Urinary Antiseptics, Cholinergics & AntiCholinergics, Acidifiers & Alkanizers.	15	25
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Autocoids and related drugs** Introduction to autacoids and classification, Histamine, 5-HT and their antagonists, Prostaglandins, Thromboxanes and Leukotrienes, Angiotensin, Bradykinin and Substance P, Non-steroidal anti-inflammatory agents, Anti-gout drugs, Antirheumatic drugs	10	10

5.	**Pharmacology of drugs acting on endocrine system** Basic concepts in endocrine pharmacology, Anterior Pituitary hormones- analogues and their inhibitors, Thyroid hormones-analogues and their inhibitors, Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D, Insulin, Oral Hypoglycemic agents and glucagon, ACTH and corticosteroids	10	20
6.	**Pharmacology of drugs acting on endocrine system** Androgens and Anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus, Bioassay:- Principles and applications of bioassay, Types of bioassay, Bioassay of insulin, oxytocin, vasopressin, ACTH,d-tubocurarine,digitalis, histamine and 5-HT	10	20
	TOTAL	60	100

List of Experiments

S.no	Experiment list	Hours
1	Introduction to in-vitro pharmacology and physiological salt solutions.	04
2	Effect of drugs on isolated frog heart.	04
3	Effect of drugs on blood pressure and heart rate of dog.	03
4	Study of diuretic activity of drugs using rats/mice.	02
5	DRC of acetylcholine using frog rectus abdominis muscle.	03
6	Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.	03
7	Bioassay of histamine using guinea pig ileum by matching method.	02
8	Bioassay of oxytocin using rat uterine horn by interpolation method.	03
9	Bioassay of serotonin using rat fundus strip by three point bioassay.	03
10	Bioassay of acetylcholine using rat ileum/colon by four point bioassay.	03
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Essentials of Medical Pharmacology	K.D.Tripathi.	JAYPEE Brothers Medical Publishers (P) Ltd
Handbook of experimental pharmacology	Kulkarni SK.	Vallabh Prakashan.

Reference Book(s):

Title	Author/s	Publication
Principles of Pharmacology	Sharma H. L., Sharma K. K.,	Paras medical publisher
Fundamentals of Experimental Pharmacology	Ghosh MN	Hilton & Company, Kolkata

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE3021	**GENERAL PHARMACOLOGY II**
CO 1	Understand the mechanism of drug action and its relevance in the treatment of different diseases.
CO 2	Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments.
CO 3	Demonstrate the various receptor actions using isolated tissue preparation.
CO 4	Appreciate correlation of pharmacology with related medical sciences.

Mapping of CO with PO

SEPE3021	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	3	3	1	2	3	1	3	2	3	2
CO 2	2	2	2	1	2		1	1	2	1	2	2
CO 3	2	2	2	2	1	2	2	1	2	2	2	1
CO 4	2	2	2	2	3	2	2	1	2	2	2	3

Mapping of CO with PSO

SEPE3021	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	2	2	2
CO 3	2	2	
CO 4	1	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Pharmacology of drugs acting on cardio vascular system	1,2
2	Pharmacology of drugs acting on cardio vascular system	2,4
3	Pharmacology of drugs acting on urinary system	2,4,5
4	Autocoids and related drugs	2,3,4,5
5	Pharmacology of drugs acting on endocrine system	1,2
6	Pharmacology of drugs acting on endocrine system	2,4

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3030
Course Name: Medicinal Chemistry
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To know the basics of medicinal chemistry, biochemical and molecular basis of mechanism of action, structure activity relationship including stereo chemical aspects.
- Understand various physicochemical properties of drug molecules in the designing the dosage forms.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Principles of medicinal chemistry** History/development of medicinal chemistry, Physicochemical properties in relation to biological action – Ionization, Drug distribution and pKa values, hydrogen bonding, protein binding, chelation, optical and geometrical isomerism, steric effect, redox potential and surface activity. Prodrugs – concepts/application of prodrug design.Introduction to QSAR.	08	20
2.	**Medicinal chemistry of drugs acting on CNS** Classification, biochemical/molecular basis of mechanism of action, structure activity relationship including stereo chemical aspects, physiochemical properties and synthesis of selected drugs belonging to the class of General anaesthetics, Anxiolytics, Sedatives and Hypnotics, Antipsychotics, Anticonvulsants/antiepileptics, CNS stimulants and Psychedelics, Analgesics, Morphine and related drugs.	07	15
3.	**Medicinal Chemistry of Drugs on ANS** Classification, biochemical/molecular basis of mechanism of action, structure activity relationship including stereo chemical aspects, and synthesis of selected drugs belonging to the class of adrenergic neurotransmitters, sympathomimetic agents. adrenergic antagonists, cholinergic receptors drugs and	07	15

	related agents, cholinergic blocking agents, ganglionic blocking agents and neuromuscular blockers.		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Medicinal chemistry of local anaesthetics and diuretics** Classification, structural basis of mechanism of action, structure activity relationship including stereo chemical aspects, physiochemical properties, design and synthesis of selected drugs belonging to the class of local anaesthetics and diuretics.	10	20
5.	**Medicinal chemistry of antihistaminic agents and eicosanoids** Classification, structure basis of mechanism of action, structure activity relationship including drugs acting on Histamine receptors, eicosanoids biosynthesis, drug action mediated by eicosanoids, design of eicosanoid drugs, antipyretics, anti-rheumatoid drugs and nonsteroidal anti-inflammatory drugs.	13	30
	TOTAL	45	100

List of Experiments

Sr. No.	Experiment List	Hours
1.	Study on stereo-chemistry of some selected drugs with models and in-silico viewer	04
2.	Synthesis of Drugs used in Diabetes involving two or more steps and	04
3.	Synthesis of Drugs used in Anti-Hypertensive drugs involving two or more steps and	04
4.	Synthesis of Drugs used in Gastro-intestinal disorders drugs involving	04
5.	Synthesis of Drugs used in Respiratory disorders drugs involving two	04
6.	Establishing the pharmacopeial standards of the Diabetes drugs	04
7.	Establishing the pharmacopeial standards of the Anti-Hypertensive drugs synthesized.	04
8.	Establishing the Pharmacopeial standards of the Gastro-intestinal	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Organic medicinal and Pharmaceutical Chemistry	Wilson and Giswold's	Wolters Kluwer
Principles of Medicinal Chemistry	Foye's	Wolters Kluwer

Reference Book(s):

Title	Author/s	Publication
Medicinal Chemistry	Burger's	PrenticeHall
Introduction to principles of drug design	Smith and Williams.	Boca Raton

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE3030	**MEDICINAL CHEMISTRY**
CO 1	Recall the various classes of medicinal compounds
CO 2	Explain the physicochemical properties, steric aspects of drugs and their metabolic pathways
CO 3	Identify the structural requirements of drugs to elicit biological response
CO 4	Design the synthetic routes for medicinal compounds
CO 5	Choose the appropriate medicinal compound for treatment of disease or disorder

Mapping of CO with PO

SEPE3030	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	2	2	2	2	2	3	2	2	2	1
CO 2	2	2	2	2	2	2	3		2	2	2	2
CO 3	2	2	2	2	2	2	2	3	1	2	2	3
CO 4	2	2	2	2	1	3	3	1	2	2	2	1
CO 5	2	2	2	2	3	2	2	3	2	2	3	3

Mapping of CO with PSO

SEPE3030	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	2	2	3
CO 3	2	3	3
CO 4	2	3	2
CO 5	3	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Principles of medicinal chemistry	1,2
2	Medicinal chemistry of drugs on CNS	1,2,3
3	Medicinal chemistry of drugs acting on ANS	1,2,3
4	Medicinal chemistry of local an aesthetics and diuretics	1,3,5
5	Medicinal chemistry of antihistaminic agents and eicosanoids	1,2,3

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3910
Course Name: Industry Aligned Learning-III
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	100	--	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- To deliver knowledge regarding utilities used in pharma industries
- To provide knowledge of management for safety systems

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	Uses of different Utilities required in Pharmaceutical Industry	10	30
2.	Importance and Elements of Equipment Qualification	10	20
Section II			
Module No.	Content	Hours	Weightage in %
3.	Purified water: A basic need to Pharmaceutical Industry, Installation, Qualification and Validation of Purified Water System.	20	30
4.	Safety systems and Procedures for Pharmaceutical Industry	5	20
	TOTAL	**45**	**100**

Text Book(s):

Title	**Author/s**	**Publication**
ICH Guideline Q10	Global Society	Indian Press

Course Evaluation:
Theory:
- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE3910	**INDUSTRY ALIGNED LEARNING-III**
CO 1	Acquire knowledge regarding various utilities required in Pharmaceutical Industry
CO 2	Ability to identify different kinds of equipment's used in pharmaceuticals industry.
CO 3	Knowledge to established purify water technologies.
CO 4	Identify various safety systems for pharmaceutical industry.

Mapping of CO with PO

SEPE3910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	1	1	1	3	1	1	2	1		
CO 2	2	2	2	1	3		2	3	2	1	1	2
CO 3	1	3	3	2	3	2	3	3	3	1	1	3
CO 4			1			3	2					

Mapping of CO with PSO

SEPE3910	PSO1	PSO2	PSO3
CO 1	2		1
CO 2	3	2	1
CO 3	3	3	
CO 4		2	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Uses of different Utilities required Pharmaceutical Industry	1,2
2	Importance and Elements of Equipment Qualification	1,2,3
3	Purified water	1,2
4	Safety systems	1,2

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3930
Course Name: Summer Training
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
--	--	--	04	--	--	100	00	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- have first-hand experience the real time situations in industrial scenario.
- get familiar with engineering applications in industrial spectrum
- learn to adapt themselves in professional scenario

Outline of the Course:

Sr. No	Content
1.	Selection of Companies
2.	Company Information collection
3.	Report Writing
4.	Presentation & Question-Answer

Course Evaluation:

Sr. No.	Evaluation criteria	Marks
1	Actual work carried & Report Submission	50
2	Final Presentation & Question-Answer session	50
TOTAL		100

Course Outcome(s):
After the completion of the course, the following course outcomes will be able to:

SEPE3930	SUMMER TRAINING
CO 1	Adequate with multinational industries and processes.
CO 2	Understand the future prospects in the process allied industries.
CO 3	Understand the requirement of the Industry and their compliances.

Mapping of CO with PO

SEPE3930	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	1	1	1	3	1	1	2	1		
CO 2	2	2	2	1	3	0	2	3	2	1	1	2
CO 3	1	3	3	2	3	2	3	3	3	1	1	3

Mapping of CO with PSO

SEPE3930	PSO1	PSO2	PSO3
CO 1	2		1
CO 2	3	2	1
CO 3	3	3	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Selection of Companies	1,2,3,4
2	Company Information collection	1,2,3,4
3	Report Writing	1,2,3,4
4	Presentation & Question-Answer	1,2,3,4

Report Writing Guidelines

A. Report Format:

15. Title Page (to be provided by the respective supervisor)

The title page of the project shall give the following information in the order listed:

- Full title of the project as approved by the Mentor;
- The full name of the student/Group of students with enrollment number;
- The qualification for which the project is submitted;
- The name of the institution to which the project is submitted;
- The month and year of submission.

16. Project Certification Form

[The form should be duly filled signed by the supervisors.]

17. Acknowledgements

[All persons (e.g. supervisor, technician, friends, and relatives) and organization/authorities who/which have helped in the preparation of the report shall be acknowledged.]

18. Table of Contents/Index with page numbering
19. List of Tables, Figures, Schemes
20. Summary/abstract of the report.
21. Introduction/Objectives of the identified problem
22. Data Analysis and Finding of Solution
23. Application of the identified solution
24. Future Scope of enhancement of the Project and Conclusion
25. “Learning during Project Work”, i.e. “Experience of Journey during Project Duration”
26. References(must)
27. Bibliography
28. Annexures (if any)

B. Guideline for Report Formatting:

- Use A4 size page with 1" margin all sides
- Header should include Project title and footer should contain page number and enrollment numbers
- Chapter Name should be of Cambria font, 20 points, Bold
- Main Heading should be of Cambria font, 14 points, Bold

- Sub Heading should be of Cambria font, 12 points, Bold
- Sub Heading of sub heading should be of Cambria font, 12 points, Bold, Italic
- Paragraph should be of Cambria font, 12 points, no margin at the start of the paragraph
- Line spacing for all content – 1.15, before - 0, after - 0
- No chapter number for reference

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH3510
Course Name: Pharma Technology – API and Formulation
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Basic knowledge of the design and operation of pharmaceutical units and of the steps of development of dosage forms through to the final product and submission to the health authorities for Production license and marketing.
- Clear the concept and the importance of particle size and particle shape in drug formulation.
- Understand of the mechanism of basic pharmaceutical operations including size reduction, mixing, separation processes, filtration, drying and freeze-drying, its importance in drug formulation and practical application on a laboratory scale.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Basic Pharmaceutical and Fine Chemical Industry** Definitions of Basic Pharmaceuticals, Intermediates, Fine Chemicals, Heavy Chemicals, Technology involved in Manufacturing of Pharmaceuticals, Unit Processes in Synthesis, Biochemical Processes in Synthesis.	06	15
2.	**Unit Processes involved in Pharma Industry** Study of the Following Chemical Processes (With References to Reagents, Mechanisms, Equipment and Manufacture of Drugs given below): Acylation, Esterification, Alkylation, Amination, Halogenation, Hydrolysis, Nitration, Oxidation and Reduction.	06	10
3.	**Unit Operations involved in Pharma Industry** Operation of Reactor, Centrifuge, Dryer, Cooling Tower, Heat Exchanger – Design, Working Principle, Validation and Cleaning Strategies, Powder Processing Area (PPA) – Conditions, Validation and Cleaning processes.	10	25
Section II			

Module No..	Content	Hours	Weightage in %
4.	**Solid Formulation** Basics of Process Automation of Solid Dosage Form Production, Study of Newer Excipients used in Gastro Retentive, Mucoadhesive Systems and Colon Specific and Sustained Release, Pulsatile Drug Delivery Systems, Formulation Development of Mouth Dissolving Tablets, Taste Masking Formulation, Sublingual and Buccal Formulations.	07	15
5.	**Liquid Formulation** Study of Advances in Liquid Formulation including Multiple Emulsion, Micro Emulsion including Self Emulsified Drug Delivery Systems and Self Micro Emulsified Drug Delivery Systems.	05	10
6.	**Semisolids Formulation** Semisolid Formulation with Special Reference to Penetration Enhancers, Emulgels, Semisolids based on Liposomes, Niosomes.	04	10
7.	**Inhalation Aerosols** Inhalation Products- Types and Clinical Role, Basic Components of Aerosol Formulations, Therapeutic Aerosols, Metered Dose Inhalers, Dry powder Inhalers, Detailed Discussion on Propellants, Package and Filling Technology, Quality Assurance of Components and Formulations	07	15
	TOTAL	45	100

Text Book(s):

Title	**Author/s**	**Publication**
Modern Pharmaceutics - Fourth Edition	Gilbert and S. Banker and Christofer T. Rhodes	Marcel Decker Series
Advanced Pharmaceutics: Physicochemical principles	Cherng-Ju uim	CRC Press – 2004
Unit Processes in Pharmacy	Ganderton David	Elsevier Ltd.
The Theory and Practice of Industrial Pharmacy	L. Lachman	CBS Publishers

Reference Book(s):

Title	**Author/s**	**Publication**
Physical characterization of Pharmaceutical Solids - Volume 70	H. T. Brittain	Marcel-Decker Series

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

After the completion of the course, the student will able to

SECH3510	PHARMA TECHNOLOGY – API & FORMULATION
CO 1	Identify basic unit processes and unit operations involved in pharma industry.
CO 2	Relate the different equipment with usage and applications.
CO 3	Differentiate api and formulation in the pharmaceutical industries
CO 4	Apply knowledge of basic science in dosage and formulation to enhance the plant efficiency.

Mapping of CO with PO

SECH3510	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1		-						1		
CO 2	1	1		1						2		1
CO 3	1	1	1	2						2		1
CO 4	1	1		1						2		1

Mapping of CO with PSO

SECH3510	PSO1	PSO2	PSO3
CO 1	1		
CO 2	1		
CO 3		1	1
CO 4		1	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Basic Pharmaceutical and Fine Chemical Industry	1,2
2	Unit Processes involved in Pharma Industry	1,2
3	Unit Operations involved in Pharma Industry	1,2
4	Solid Formulation	1,2
5	Liquid Formulation	1,2
6	Semisolids Formulation	1,2
7	Inhalation Aerosols	1,2

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH3520
Course Name: Process Auxiliaries and Utilities in Allied industries
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand the designing the process plants or creating design layouts of plant.
- understand fundamentals of chemical engineering viz. development of flow diagrams, importance of various design consideration during the development and design of any process.
- rapidly increase advancement of knowledge and relevant importance and application of various process auxiliaries and utilities used in industries.
- deals with the basics as well as advanced understanding of various process auxiliaries and utilities used in chemical plant.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Process Auxiliaries** Basic Considerations and Flow Diagrams in Chemical Engineering Plant Design.	02	05
2.	**Piping Design** Selection of Material, Pipe Sizes, Working Pressure, Basic Principles of Piping Design, Piping Drawings, Pipe Installations, Overhead Installations, Process Steam Piping, Selection and Determination of Steam – Pipe Size, Piping Insulation, Application of Piping Insulation, Weather Proof and Fire Resisting Pipe Insulation Jackets, Piping Fittings, Pipe Joints.	10	20
3.	**Valves** Types of Valves, Selection Criteria of Valves for various systems.	05	10
4.	**Pumps** Types of Pumps, NPSH Requirement, Pump Location, Pump Piping, Pump Piping Support, Process Control and Instrumentation Diagram, Control System Design for Process Auxiliaries.	05	15
Section II			
Module	Content	Hours	Weightage

No.			in %
5.	**Process Utilities** Process Water: Sources of Water, Hard and Soft water, Requisites of Industrial Water and its Uses, Methods of Water Treatment, Chemical Softening, Demineralization, Resins Used for Water Softening, Water for Boiler, Cooling Purposes, cooling towers, Drinking and Process Water Treatment.	08	15
6.	**Steam** Steam Generation and its Application in Chemical Process Plants, Distribution and Utilization, Steam Economy, Condensate Utilization, Steam Traps and their Characteristics, Selection and Application, Waste Heat Utilization.	08	15
7.	**Compressors and Vacuum Pumps** Types of Compressors and Vacuum Pumps and their Performance Characteristics, Methods of Vacuum Development and their Limitations, Materials Handling Under Vacuum, Lubrication and Oil Removal in Compressors and Pumps, Instrument Air.	05	15
8.	**Refrigeration System** Refrigeration and Chilling Systems, Oil Heating Systems, Nitrogen Systems.	02	5
	TOTAL	45	100

Text Book(s):

Title	**Author/s**	**Publication**
Process Plant layout and Piping Design	Roger Hunt and Ed Bausbacher	PTR Prentice-Hall Inc
Process utility systems	Jack Broughton	Institution of Chem. Engineers, U.K.

Reference Book(s):

Chemical Engineering Plant Design	F.C. Vibrandt and C.E. Dryden	McGraw Hill, Fifth Edition
Plant design and Economics for Chemical Engineers	M.S. Peters and Timmerhaus	Mc Graw Hill 3rd Edition

Web Material Link(s):

- https://nptel.ac.in/syllabus/105102089/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

After the completion of the course, the student will able to

SECH3520	PROCESS AUXILIARIES & UTILITIES IN ALLIED INDUSTRIES
CO 1	Describe overall knowledge about the process plant.
CO 2	Anlayze the importance of process auxiliaries and utilities in process industries.
CO 3	Apply the conceptual design of chemical process plant.
CO 4	Build a bridge between theoretical and practical concepts used for process auxiliaries and utilities in any process industry.

Mapping of CO with PO

SECH3520	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1							2					
CO 2												
CO 3							2					1
CO 4												

Mapping of CO with PSO

SECH3520	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	3	1	2
CO 3	3	2	2
CO 4	3		

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Process Auxiliaries	1,2,3,4
2	Piping Design	1,2,3,4,5,6
3	Valves	1,2,3,4
4	Pumps	1,2,3,4
5	Process Utilities	1,2,3,4
6	Steam	1,3,4,5
7	Compressors and Vacuum Pumps	1,2,3,4,5
8	Refrigeration System	1,2,4

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH3530
Course Name: Air Pollution & Control
Prerequisite Course(s): -

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- understand various effects of air pollution.
- impart the knowledge on air pollution.
- analyze causes and effects of air pollution.
- familiarize with strategic planning for control of air pollution.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Air Pollution** Definition of Air Pollution - Sources and Classification of Air Pollutants-Effects of Air Pollution-Global Effects-Air Quality Emission Standards-Sampling of Pollutants in Ambient Air-Stack Sampling.	06	15
2.	**Meteorology and Air Pollution** Factors influencing Air Pollution, Wind Rose, Mixing Depths, Lapse Rates and Dispersion, Atmospheric Stability, Plume rise and Dispersion, Prediction of Air Quality, Box Model, Gaussian model, Dispersion Coefficient, Application of Tall Chimney for Pollutant Dispersion.	06	15
3.	**Control of Particulate Pollutants** Properties of Particulate Pollution, Particle Size Distribution, Control Mechanism, Dust Removal Equipment, Design and Operation of Settling Chambers, Cyclones, Wet Dust Rubbers, Fabric Filters and ESP.	06	10
4.	**Control of Gaseous Pollutant** Process and Equipment for the Removal of Gaseous Pollutants by Chemical Methods – Design and Operation of Absorption and Adsorption Equipment, Combustion and Condensation equipment.	04	10
Section II			
Module	Content	Hours	Weightage in %

5.	**Control Of Air Pollution** Zoning and Site Selection-Other Management Controls, API Legislation, Automobile Pollution and Control-Emission Standards.	07	15
6.	**Urban Air Pollution** Sectoral Analysis, Trends in Major Cities of India and Government initiatives.	05	10
7.	**Introduction to indoor air pollution**	04	10
8.	**Global effects of air pollution** Green House Effects, Acid Rain and Ozone Layer Depletion, International Agreements for Mitigating Global Air Pollution Effects.	07	15
	TOTAL	45	100

Text Book(s):

Title	**Author/s**	**Publication**
Air pollution	Wark and Warner	Harper & Row, New York.
Air Pollution	M.N.Rao and H.V.N.Rao	McGraw Hill Education
Air pollution	Prof. K.V.S.G. Muralikrishna	Kaushal Publications – Kakinada

Reference Book(s):

An introduction to Air Pollution	R.K. Trivedy and P.K. Goel	B.S. Publications

Web Material Link(s):

- https://nptel.ac.in/syllabus/105102089/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

After the completion of the course, the student will able to

SECH3530	**AIR POLLUTION & CONTROL**
CO 1	Design various air pollution control equipment and evaluate its use.
CO 2	Classify and identify the sources of air pollutants and predict the effects of air pollutant on human health and environment.
CO 3	Analyze the air quality and relate with air pollution regulation.
CO 4	Apply and relate the significance of various air pollution dispersion models.

Mapping of CO with PO

SECH3530	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1	1								
CO 2	1	1	1	1			2	3		1	1	
CO 3						2				1		
CO 4		1	1	1								

Mapping of CO with PSO

SECH3530	PSO1	PSO2	PSO3
CO 1	2		
CO 2	1	1	1
CO 3			
CO 4			

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Air Pollution	1, 2
2	Meteorology and Air Pollution	1,2,3,6
3	Control of Particulate Pollutants	2, 4
4	Control of Gaseous Pollutant	2, 4
5	Control Of Air Pollution	1,2,5
6	Urban Air Pollution	1,2
7	Introduction to indoor air pollution	1,2
8	Global effects of air pollution	1,2

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH3540
Course Name: Polymer Science & Technology
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- get knowledge of polymers, polymerization techniques and behavior in polymers.
- explore various types of thermoplastics, thermosetting and elastomers.
- Familiarize with various polymer processing techniques for polymers, rubbers and fibers.
- get knowledge on various testing methods and characterization of polymers.
- get knowledge on specialty polymers.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction to Polymers** Polymers, Polymerization, History of polymers, Pioneers in Polymer Science, Chemistry of Polymerization –Addition, Condensation, Coordination Polymerization –Mechanism and Kinetics, Degree of Polymerization, Polymerization Conditions (Bulk, Solution, Precipitation, Suspension, Emulsion, Interfacial), Crystallinity–Polymer Single Crystals, Spherulite Sand Glass Transition Temperature(tg).	07	15
2.	**Thermoplastics, Thermosetting and Elastomers** Thermoplastic Polymers – Poly-Olefins – Vinyl Polymers – Polystyrene, PMMA - Pan, Thermoplastic Polymers – Teflon – Polyamides – Polycarbonates and their Applications, Thermosetting Polymers – Phenolic Resins –Polyesters – Epoxies – Polyurethanes and their Applications, Elastomers- Natural rubber – Isoprene Rubber, Synthetic Rubbers - Butadiene Rubber- Butyl Rubber-Styrene Butadiene Rubber, Chloroprene Rubber- Nitrile Rubber - Silicone Rubber.	10	25
3.	**Polymer Processing** Processing of Thermoplastics and Thermosetting plastics – Compounding and Processing Aids, Compression Moulding -	05	10

	Injection Moulding – Extrusion Moulding, Blow Moulding, Rotational Moulding, Transfer Moulding, Processing of Rubbers – Vulcanization, Mastication – Calendaring, Reaction Injection Moulding – Solution Casting – SMC and DMC, Fiber Spinning and Drawing.		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Testing & Characterization of Polymers** Polymer Characterization Tests - Melt Flow Index, Capillary Rheometer Test, Viscosity Test, GPC, Thermal Analysis Techniques – DSC, TGA and TMA, Morphology - SEM, TEM, XRD, Mechanical Properties- Tensile Test, Impact Test, Hardness, Electrical properties –Di-Electric Strength & Di-Electric Constant, Thermal Properties- HDT, Vicat.	13	30
5.	**Specialty Polymers** Poly-Electrolytes and Ionomers, Conducting Polymers –Electro-Luminescent Polymers, High temperature Polymers and Polymer Blends, Polymer Composites and Nano-Composites, Interpenetrating Polymer Networks, Liquid Crystalline Polymers, Biomedical Polymers.	10	20
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Polymer Science	V R Gowariker, Vasant R. Gowariker, N V Viswanathan, JayadevSreedhar	New Age International, 2nd Edition
Polymer Science and Technology	Joel R.Fried	PHI, Eastern Economy Edition, 2nd Edition

Reference Book(s):

Text book of Polymer Science	Billmeyer F. W.	3rd edn., Wiley, Singapore, 1984
Speciality Polymers	R.W. Dyson	Chapman and Hall, New York, 1987
Handbook of Plastics Testing Technology	Vishu Shah	Wiley international publication

Web Material Link(s):

- https://nptel.ac.in/courses/113105028/

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.

- End Semester Examination consists of 60 marks.

Course Outcome(s):

After the completion of the course, the student will able to

SECH3540	POLYMER SCIENCE & TECHNOLOGY
CO 1	Elaborate on step growth and chain polymerization with respect to mechanism and kinetics.
CO 2	Elaborate on the differences between crystalline melting temperature and glass transition temperature, as well as the effect of kinetics on both.
CO 3	Distinguish between absolute and relative methods for molecular weight determination.
CO 4	Interpret experimental data and determine parameters such as polymerization rates and copolymer composition.
CO 5	Estimate the solubility of a given polymer in various solvents and blends.

Mapping of CO with PO

SECH3540	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	1					2	3	1	2		2
CO 2	2	1				3	3	3	1	3		2
CO 3	2	2				2	3		3	2		3
CO 4	2	2				2	1	1	2	3		2
CO 5	2	2				2	3	3	2	3	1	3

Mapping of CO with PSO

SECH3540	PSO1	PSO2	PSO3
CO 1	3	2	1
CO 2	3	3	3
CO 3	3	1	3
CO 4	3	2	2
CO 5	3	2	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Introduction to Polymers	1,2
2	Thermoplastics, Thermosetting and Elastomers	1,2
3	Polymer Processing	1,2,4
4	Testing & Characterization of Polymers	1,2,4
5	Specialty Polymers	1,2

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3040
Course Name: Chemistry of Natural Products
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To learn, classify and understand chemistry and structural aspects of medicinal compounds from various natural sources and relate to therapeutic applications
-

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Structural basis of natural products** Chemical and spectral approaches to simple molecules of natural origin. identification of natural products by chromatographic and spectroscopic methods and application of I.R., N.M.R. and Mass spectroscopy in the structural elucidation of organic compounds. Concept of stereoisomerism taking examples of natural products Eg. citral, menthol, camphor, ephedrine, atropine etc.; standardization of traditional drug formulations, chromatographic study of some herbal constituents.	08	20
2.	**Glycosides** Classification, biosynthetic studies and basic metabolic pathways, introduction to biogenesis of secondary metabolites, chemistry, general methods of extraction, isolation, chemical tests, isolation, medicinal properties and structural elucidation of sennosides, cardinolides and bufadienolides, digoxin and digitoxin, introduction to scillaren A and ouabein.	08	15
3.	**Alkaloids** Classification, biosynthetic studies and basic metabolic pathways, introduction to biogenesis of secondary metabolites, chemistry, general methods of extraction, isolation, chemical tests, isolation and structural elucidation	06	15

	of Pyridine alkaloids, Tropane alkaloids, Quinoline and Isoquinoline alkaloids, Phenanthrine alkaloids, Indole alkaloids, Imidazole alkaloids, Alkaloid amines, Glycoalkaloid, Xanthine alkaloid.		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Terpenes and Flavonoids** Classification, biosynthetic studies and basic metabolic pathways, introduction to biogenesis of secondary metabolites, chemistry, general methods of extraction, isolation, chemical tests, isolation, medicinal properties and structural elucidation, flavonoids, quercetin; Terpenes– special isoprene rule, mono, diterpenes, triterpenoids and sesquiterpenes, and structural elucidation of citral, carvone, menthol and camphor; Steroids – cholesterol, colour reactions, reactions of steroids, stigmasterol, β-Sitotsterol, bile acids, ergosterol, diosgenin, solasodine, hecogenin.	12	30
5.	**Study of traditional drugs** Classification of indigenous drugs traditional drugs, common vernacular names, botanical source, chemical constituents, uses and marketed formulations with ingredients like – Amla, Satavari, Bhilwua, bael, bach, rasna, punarnava, gokhru, shankhapusphi, brahmi adusa, arjuna, lahsun, guggul, gymnema, neem ,tulsi, Shilajit and Spirulina.	11	20
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Chemistry of Organic Natural Products	O.P. Agarwal	Krishna Prakashan Media
Organic Chemistry of Natural Products	Gurdeep Chatwal	Himalaya Publishing House

Reference Book(s):

Title	Author/s	Publication
Pharmacognosy	Brady and Tyler.E.	New YorkEllis Horwood 1990
Pharmacognosy	G.E. Trease & W.C.Evans.	New York, MarcelDekker 1988

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE3040	CHEMISTRY OF NATURAL PRODUCTS
CO 1	Classify extract, isolate and characterize the natural products by chemical tests.
CO 2	Understand the classification, metabolic pathways, metabolites and their structural elucidation.
CO 3	To know about the examples of green reactions and future trends in green reaction.
CO 4	To learn the synthesis, psychological properties, isolation medicinal importance and other synthetic use of terpenes and alkaloids.

Mapping of CO with PO

SEPE3040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1	1		2	2	1		2	2	1
CO 2	1	1	2	2	3		2	1	1	1	2	
CO 3	1	1	1	1	1		3		2	2	3	2
CO 4	1	1	1	2		2	3		1	2	1	1

Mapping of CO with PSO

SEPE3040	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	3	1	2
CO 3	3	3	2
CO 4	3	2	

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Structural Basis Of Natural Products	1,2
2	Glycosides	1,2
3	Alkaloids	1,2,4
4	Terpenes and Flavonoids	1,2,4
5	Study Of Traditional Drugs	1,2

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3050
Course Name: Technology of Solid Dosage forms
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To provide the concepts of various parameters involved in the formulation and development of various dosage forms.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Preformulating studies** Study of physical/physicochemical properties of drugs like physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution, organoleptic properties and their effect on formulation, stability and bioavailabilty. Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemisation, polymerization etc. and their influence on formulation. Stability Studies: Basic concept and objectives of stability study.	08	20
2.	**Liquid and semi solid dosage forms** Introduction, types of additives used, vehicles, stabilizers, preservatives, emulsifying agents, solubilizers, colors, flavours, manufacturing, packaging and evaluation of solutions, suspensions and emulsions. Definitions, types, mechanisms of drug penetration through skin, factors influencing penetration, semisolid bases and their selection. General formulation/ manufacture of semisolids, clear gels, evaluation and packaging.	07	10

3.	**Solid dosage forms** Classification of different types of tablets, tablets equipments, granulation technology on large scale by various techniques. Tablets tooling, different types of tablets compression machinery, processing problem of tablets and evaluation of tablets. Coating of tablets: Types of coating, Sugar coating, film forming materials, formulation of coating solution, equipment for coating, film defects and evaluation of coated tablets. Advantages & disadvantages of capsule dosage form, extraction of gelatin, production of hard gelatin capsules, size of capsules and method of capsule filling. Soft gelatin capsule, Nature of capsule shell & capsule content.	07	20
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Parenteral Products** Preformulation factors, routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, isotonicity & methods of its adjustment. Formulation details, containers and closures and their selection. Prefilling treatment, washing the container and closers, preparation of solution and suspension, filling, closing of ampoules, vials infusion fluids, lyophilization, preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products. Aseptic techniques: Source of contamination, methods of prevention, design of aseptic area, laminar flow bench, air handling units, services and maintenance.	14	30
5.	**Pharmaceutical Aerosols** Definition, propellants, general formulation, manufacturing, packaging methods, pharmaceutical applications and evaluation.	09	20
	TOTAL	**45**	**100**

List of Experiments

S.no	**Experiment list**	**Hours**
1	Preformulation studies on prepared granules.	02
2	Preparation and evaluation of suspensions.	04
3	Preparation and evaluation of emulsions.	04
4	Preparation and evaluation of creams.	04
5	Preparation and evaluation of ointments.	04
6	Preparation and evaluation of injections.	04
7	Manufacture and evaluation of granules.	04
8	Formulation and filling of hard gelatin tablets.	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
The Science of Dosage Form Design	Aulton, Michael E.	2nd Ed., Churchill Livingstone, 2002.
Pharmaceutical dosage forms: Tablet	H. A. Liberman,, L. Lachman, and J. B. Schwartz	Vol. 1,2 and 3, 2nd Edition Marcel Dekker, 1989.

Reference Book(s):

Title	Author/s	Publication
"Pharmaceutical Dosage Forms: Parenteral Medications"	Avis, K.E. et al.	Vol.1-3, 2nd Ed., Marcel Dekker, 2005.
" Pharmaceutical Dosage Forms : Tablets"	Libermann, H.A. et al.	Vol.1-3, 2nd Ed., Marcel Dekker, 2005.

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE3050	TECHNOLOGY OF SOLID DOSAGE FORMS
CO 1	Understand the factors influencing the development of various dosage forms.
CO 2	Understand the formulation concepts and evaluate different dosage forms to meet out the compendial requirements.
CO 3	Understand various physicochemical properties of drug molecules in the designing the dosage form.
CO 4	Appreciate physicochemical properties of drug molecules in formulation research and development.

Mapping of CO with PO

SEPE3050	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	3	2	3	2	3	3	3	2	1	2
CO 2		2	2	2	3	3	3		2	3	2	1
CO 3	2	3	3	3	1	2	3	3	2	2	2	3
CO 4	2	3	3	2	3	2		3	3	2	2	3

Mapping of CO with PSO

SEPE3050	PSO1	PSO2	PSO3
CO 1	3	2	3
CO 2	3	2	3
CO 3	2	3	3
CO 4	2	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Preformulation Studies	1,2
2	Liquids And Semi – Solid Dosage Forms	1.2
3	Solid Dosage Forms	2,4,5
4	Parenteral Products	2,4,5
5	Pharmaceutical Aerosols	1,2,3

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3060
Course Name: Quality Control and Quality Assurance-Instrumentation & Validation Process
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to
- understand the importance of quality
- learn about ISO management systems
- know the tools for quality improvement
- analyze the issues in quality

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Introduction** Concept and evolution and Scopes of Quality Control and Quality Assurance, Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q series guidelines. Good Laboratory Practices: Scope of GLP, Definitions, Quality Assurance Unit, Protocol for Conduct of Non-Clinical Testing, Control on Animal House, Report Preparation and Documentation. CPCSEA Guidelines	07	14
2.	**Inspection Convention** cGMP Guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention(PIC), WHO and EMEA Covering: Organization and Personnel Responsibilities, Training, Hygiene and Personal Records, Drug Industry Location, Design, Construction and Plant Lay Out, Maintenance, Sanitation, Environmental Control, Utilities and Maintenance of Sterile Areas, Control of Contamination and Good Warehousing Practice.	07	18
3.	**Quality Control** Analysis of Raw Materials, Finished Products, Packaging Materials, In Process Quality Control (IPQC), Developing Specification (Ich Q6 And Q3), Purchase Specifications and Maintenance of Stores for Raw Materials. In Process Quality Control and Finished Products Quality Control for Following Dosage Forms in Pharma Industry according to Indian, US and British Pharmacopoeias: Tablets, Capsules, Ointments,	08	18

	Suppositories, Creams, Parenterals, Ophthalmic and Surgical Products (How to Refer Pharma Copoeias).		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Documentation** Documentation in Pharmaceutical Industry: Three tier documentation, Policy, Procedures and Work Instructions, and Records (Formats), Basic Principles- How to Maintain, Retention and Retrieval etc. Standard Operating Procedures (How to write), Master Batch Record, Batch Manufacturing Record, Quality Audit Plan and Reports. Specification and Test Procedures, Protocols and Reports. Distribution Records. Electronic Data Handling. Concepts of Controlled and Uncontrolled Documents. Submission documents for regulators DMFs, as Common Technical Document an Electronic Common Technical Documentation (CTD, eCTD). Concept of regulated and non regulated markets.	12	25
5.	**Manufacturing Operations and Controls** Sanitation of Manufacturing Premises, Mix-Ups and Cross Contamination, Processing of Intermediates and Bulk Products, Packaging Operations, IPQC, Release of Finished Product, Process Deviations, Charge-In of Components, Time Limitations on Production, Drug Product Inspection, Expiry Date Calculation, Calculation of Yields, Production Record Review, Change Control, Sterile Products, Aseptic Process Control, Packaging, Reprocessing, Salvaging, Handling of Waste and Scrap Disposal. Introduction, Scope and Importance of Intellectual Property Rights. Concept of Trade Mark, Copyright and Patents.	11	25
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Quality Assurance Guide by organization of Pharmaceutical Procedures of India	D H Shah	3rd revised edition, Volume I & II, Mumbai, 1996.
How to Practice GMP's	P P Sharma,	Vandana Publications, Agra, 1991.

Reference Book(s):

Title	Author/s	Publication
Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I & II, 2nd edition	--	WHO Publications, 1999
Good laboratory Practice Regulations –, Volume 38,	Allen F. Hirsch	Marcel Dekker Series, 1989

Web Material Link(s):

- www.pharmaguide.com

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration and average of the same will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Course Outcome(s):

After the completion of the course, the student will able to

SEPE3060	**QUALITY CONTROL AND QUALITY ASSURANCE – INSTRUMENTATION AND VALIDATION PROCESS**
CO 1	Analyze importance of quality control and quality assrance roles in process industries.
CO 2	Discover about iso management systems and their applications for qc qa laboratories.
CO 3	Execute tools for quality improvement in the research and development field.
CO 4	Analyze issues in quality control and process.
CO 5	Predict quality evaluation of various products generated by chemical process industries.

Mapping of CO with PO

SEPE3060	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1		1	1	1	2	1	1	2	1	1	2
CO 2	1	1		2	1	2	1	1	2	1	2	1
CO 3		1	1	1	1		1	1		2	3	2
CO 4	1	1	1	1	1		1	3	1	1	2	1
CO 5		2	1	2	1	2	2	-	2	2	2	1

Mapping of CO with PSO

SEPE3060	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	1	1	1
CO 3	1		1
CO 4		1	1
CO 5	3	2	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Introduction	1,2
2	Inspection Convention	1,2
3	Quality Control	1,2
4	Documentation	1,2
5	Manufacturing Operations and Controls	1,2

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE3920
Course Name: Industry Aligned Learning-IV
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- Understand various 5S system.
- Know the principles of AHU/HVAC.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	Housekeeping and 5S System as a culture for sustainable business	25	25
2.	Installation, Qualification and Validation of AHU/HVAC/Dust & Vapor Extraction System	10	25
Section II			
Module No.	Content	Hours	Weightage in %
3.	Types of Maintenance: Breakdown Maintenance, Preventive Maintenance, Predictive Maintenance	10	50
	TOTAL	45	100

Text Book(s):

Title	**Author/s**	**Publication**
ICH Guideline Q10	Global Society	Indian Press

Course Evaluation:
Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE3920	INDUSTRY ALIGNED LEARNING-IV
CO 1	Acquire knowledge regarding 5S for sustainable business.
CO 2	Ability to identify different kinds of AHU.
CO 3	Knowledge to established energy conservation in pharmaceutical industry.
CO 4	Identify various, Breakdown Maintenance, Preventive Maintenance, Predictive Maintenance.

Mapping of CO with PO

SEPE3920	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1			1	1			3	1	1	2	2	1
CO 2	1	1	2	1	1	2	1	1	1	1	2	1
CO 3	1	1	1	1	1		2		2	1	2	1
CO 4		1	1	1	1		1	3	2	1	1	1

Mapping of CO with PSO

SEPE3920	PSO1	PSO2	PSO3
CO 1			2
CO 2	2	2	
CO 3	3	2	1
CO 4	2	2	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Housekeeping and 5S System as a culture for sustainable business	1,2,3
2	Installation, Qualification and Validation of AHU/HVAC/Dust & Vapor Extraction System	1,2,3,4
3	Types of Maintenance: Breakdown Maintenance, Preventive Maintenance, Predictive Maintenance	1,2,4

P P Savani University
School of Engineering
Department of Chemical Engineering

Course Code: SECH3052
Course Name: Chemical Reaction Kinetics - I

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	20	30	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- understand the basic principles of kinetics and chemical reaction engineering by the application of Stoichiometry, thermodynamics and mathematical analysis.
- utilize this knowledge in the design of industrial chemical reactors.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Fundamentals of Reaction Engineering** Overview of chemical reaction engineering, Rate of Reaction, Elementary and non-elementary homogeneous reactions, Molecularity and order of reaction, Mechanism of reaction, Temperature dependency from thermodynamics, Collision and Activated complex theories.	04	10
2.	**Rate Laws, Kinetics and Mechanisms of Homogeneous and Heterogeneous Reactions** Kinetic models for non-elementary reactions, Testing kinetic models, Temperature dependent term of rate equations from Arrhenius theory and comparison with collision and transition state theory, Activation energy and temperature dependency, Predictability of reaction rate from theory.	06	10
3.	**Analysis of Rate Data** Integral and differential methods for analyzing kinetic data, interpretation of constant volume reactor, zero, first, second and third order reactions, half life period, irreversible reaction in parallel and series, catalytic reaction, auto catalytic reaction, reversible reactions.	06	10
4.	**Introduction to Reactor Design** Interpretation of variable volume batch reactions for zero, first and second order reactions, design equation for batch, continuous stirred tank, plug flow reactors for isothermal reaction.	06	20

Section II			
Module	Content	Hours	Weightage in %
5.	**Design of industrial reactors** Optimum reactor size, plug flow/mixed flow reactors in series and parallel, recycle reactor.	07	15
6.	**Design of reactors for single and parallel reaction** Size comparison of single reactors, multiple reactor systems, recycles reactor and autocatalytic reactions. Introduction to multiple reactions, qualitative and quantitative treatment of product distribution and of reactor size, the selectivity.	08	15
7.	**Residence time distributions** Residence time distribution of fluids in vessels, E, F and C curves, Dispersion model, Tank in series model. Non-Isothermal PFR and CSTR, Safety issues in Non-Isothermal Reactors.	08	20
	TOTAL	45	100

List of Experiments:

Sr. No.	Name of Practical	Hours
1.	To study the interpretation of Batch Reactor Data.	02
2.	To determine energy of activation of reaction between ethyl acetate with sodium hydroxide.	04
3.	To determine reaction equilibrium constant of reaction of acetic acid with ethanol.	04
4.	To measure the kinetics of a reaction between ethyl acetate and sodium hydroxide under condition of excess ethyl acetate at room temperature.	04
5.	To determine the kinetics of the reaction between ethyl acetate and sodium hydroxide at room temperature by the integral method of analysis.	04
6.	To determine the kinetics of the reaction between ethyl acetate and sodium hydroxide at room temperature by the differential method of analysis.	04
7.	To determine reaction equilibrium constant of reaction between acetic acid with ethanol.	04
8.	To study the kinetics of saponification reaction between acetic acid and sodium hydroxide in a batch reactor and establish the rate law.	04
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Chemical Engineering Kinetics - 3rd Edition	J. M. Smith	McGraw-Hill (1990)
Chemical Reaction Engineering - 3rd Edition	O. Levenspiel	John Wiley (1998)

Reference Book(s):

Title	Author/s	Publication
Elements of Chemical Reaction Engineering	H. Scott Fogler	Prentice Hall of India Pvt. Ltd
The Engineering of Chemical Reactions	L. D. Schmidt	Oxford Press

Course Evaluation:

Theory:

- Continuous Evaluation consists of two tests each of 30 marks and 1 Hour of duration, which will be converted to 30 marks.
- Faculty evaluation consists of 10 marks as per the guidelines provided by the course coordinator.
- End Semester Examination consists of 60 marks.

Practical:

- Continuous Evaluation consists of performance of Practical which will be evaluated out of 10 marks for each practical and average of the same will be converted to 10 marks.
- Internal Viva consists of 10 marks.
- Practical performance/quiz/drawing/test of 15 marks during End Semester Exam.
- Viva/Oral presentation consists of 15 marks during End Semester Exam.

Course Outcome(s):

After the completion of the course, the student will able to

SECH3052	**CHEMICAL REACTION KINETICS-I**
CO 1	Classify the concept of reactor design for chemical process industries.
CO 2	Analyze kinetics and rate law based on experimental data obtained from the laboratory.
CO 3	Perform calculations on plug, mixed, and batch reactors for homogeneous and heterogeneous reactions.
CO 4	Develop skills to choose, design and scale the right kind of reactor for a given reaction.

Mapping of CO with PO

SECH3052	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	2	2	1		1			1	1	
CO 2	2	2	1	2	1		1			1	1	
CO 3	1	2	1	2	1		1			1	1	
CO 4	2	2	2	2	1		1			1	1	

Mapping of CO with PSO

SECH3052	PSO1	PSO2	PSO3
CO 1	2	3	3
CO 2	2	3	3
CO 3	2	3	3
CO 4	2	3	3

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Fundamentals of Reaction Engineering	2,3
2	Rate Laws, Kinetics and Mechanisms of Homogeneous and Heterogeneous Reactions	2,3,5
3	Analysis of Rate Data	4,5,6

4	Introduction to Reactor Design	1,2,4
5	Design of industrial reactors	2,5,6
6	Design of reactors for single and parallel reaction	5,6
7	Residence time distributions	1,2,4,6

FOURTH YEAR B. TECH.

P P SAVANI UNIVERSITY																
SCHOOL OF ENGINEERING																
TEACHING & EXAMINATION SCHEME FOR B. TECH. PHARMACEUTICAL ENGINEERING PROGRAMME AY: 2021-22																
Sem	**Course Code**	**Course Title**	**Offered By**	**Teaching Scheme**					**Examination Scheme**							
				Contact Hours				**Credit**	**Theory**		**Practical**		**Tutorial**		**Total**
				Theory	**Practical**	**Tutorial**	**Total**		**CE**	**ESE**	**CE**	**ESE**	**CE**	**ESE**	
7	SEPE4010	Regulatory Requirements in Pharmaceutical Industries	PE	4	0	0	4	4	40	60	0	0	0	0	100
	SEPE4020	Pharmaceutical Instrumental Analysis	PE	3	2	0	5	4	40	60	20	30		0	150
	SEPE4030	Dosage Formulation Design	PE	3	0	0	3	3	40	60	0	0	0	0	100
	SEPE4040	Computer Applications in Pharmaceutical Engineering	PE	3	2	0	5	4	40	60	50	0	0	0	150
	SEPE4910	Industry Aligned Learning-V	PE	3	0	0	3	3	100	0	0	0	0	0	100
	SEPD4010	Creativity, Problem Solving & Innovation	SEPD	3	0	0	3	3	100	0	0	0	0	0	100
	SEPE4920	Project/Summer Internship	PE	5			0	5	0	0	100	0	0	0	100
						Total	**23**	**26**							**800**
8	SEPE4930	Project / Training	PE	17			20	17	0	0	200	300	0	0	500
						Total	**20**	**17**							**500**

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE4010
Course Name: Regulatory Requirements in Pharmaceutical Industries
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
04	--	--	04	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To provide basics of regulatory requirements of pharmaceuticals.
- To provide basics of good manufacturing practices, scientific and risk-based product development approached, validations and regulatory requirements of pharmaceuticals

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Schedule governing pharmaceutical product development (e.g. Schedule M, Schedule Y).**	05	10
2.	ICH guidelines Q8(R2), Q9, Q10, Q11 and Q12	05	05
3.	Documentation for pharmaceuticals	03	05
4.	**Introduction to regulatory aspects of pharmaceuticals** • Introduction to Regulatory aspects of pharmaceuticals, need, advantages and limitation • Introduction to major regulatory bodies worldwide • Rationale for regulatory harmonization and introduction of ICH • Introduction to CTD Modules	10	15
5.	**Drug Master file (DMF)**	02	05
6.	**Regulatory procedure for pharmaceutical product market approval as per USFDA guidelines:** Investigational New Drug Application (IND)- filing, review, approval process and representative case studies	05	10
Section II			
Module No.	Content	Hours	Weightage in %
	Regulatory procedure for pharmaceutical product market approval as per USFDA guidelines:		

7.	New Drug Application (NDA) [505 (b) (1) and (b) (2)]- filing, review, approval process and representative case studies. Abbreviated New Drug Application (ANDA) 505 (j)- filing, review, approval process and representative case studies	12	20
8.	**Regulatory procedure for pharmaceutical product market approval as per USFDA guidelines:** New Animal Drug Application (NADA)- filing, review, approval process and representative case studies. Biological License Application (BLA)- filing, review, approval process and representative case studies	13	20
9.	Comparison of Indian, European and rest of the world Regulatory procedure for pharmaceutical product market approval in comparison to USFDA guidelines	05	10
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Modern Pharmaceutics	G. S. Banker	New York, Marcel Dekker 1990
Fundamentals of Pharmacy	Blome H. E.	Philadelphia, Fea and Febiger, 1985

Reference Book(s):

Title	Author/s	Publication
Pharmaceutical Production Facilities: Design and Applications	G. C. Cole	New York Ellis Horwood 1990
Drug Delivery Devices: Fundamentals and Applications	Tyle	New York, Marcel Dekker 1988

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE4010	REGULATORY REQUIREMENT IN PHARMACEUTICAL INDUSTRIES
CO 1	Explain the regulatory pathways for new drug application and generic product development.
CO 2	Exposure to impact of regulatory statutes on process development.
CO 3	Explain Drugs and Cosmetics act, Drug price control order and regulations therein.
CO 4	Explain the regulatory pathways for new drug application and generic product development

Mapping of CO with PO

SEPE4010	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	2	2	2	2	1	1	2		1	2
CO 2	1	2	1	2	1	2		1	3	2	2	
CO 3	1	2		1	1	2	2		2	1	2	1
CO 4	2	1	2	2	2		2	1	3	1	2	3

Mapping of CO with PSO

SEPE4010	PSO1	PSO2	PSO3
CO 1	3	2	2
CO 2	1	2	1
CO 3	3	1	1
CO 4	1	1	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Schedule governing pharmaceutical product development	1,2
2	ICH guidelines	1,2
3	Documentation for pharmaceuticals	1,2,4
4	Introduction to regulatory aspects of pharmaceuticals	1,2,4
5	Drug Master file (DMF)	1,2
6	Regulatory procedure for pharmaceutical product market approval as per USFDA guidelines	1,2,3,4,5
7	Regulatory procedure for pharmaceutical product market approval as per USFDA guidelines	1,2,3,4,5
8	Regulatory procedure for pharmaceutical product market approval as per USFDA guidelines	1,2,3,4,5
9	Comparison of Indian, European and rest of the world Regulatory procedure	2,5

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE4020
Course Name: Pharmaceutical Instrumental Analysis
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	20	30	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To know the application of instrumental methods in qualitative and quantitative analysis of drugs.
- To know the knowledge on the principles and instrumentation of spectroscopic and chromatographic technique.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**UV Visible spectroscopy** Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode. Applications - Spectrophotometric titrations, Single component and multi component analysis	10	15
2.	**Fluorimetry** Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications	05	15
3.	**IR spectroscopy** Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications **Flame Photometry-**Principle, interferences, instrumentation and applications Atomic absorption spectroscopy- Principle,	07	20

	interferences, instrumentation and applications. Nepheloturbidometry- Principle, instrumentation and applications		
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Gas chromatography -** Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications. **High performance liquid chromatography (HPLC)-**Introduction, theory, instrumentation, advantages and applications.	08	20
5.	**Introduction to chromatography** **Adsorption and partition column chromatography-** Methodology, advantages, disadvantages and applications. **Thin layer chromatography-** Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.	10	20
6.	**Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications.	05	10
	TOTAL	45	100

List Of Experiments

Sr. No.	Experiment List	Hours
1.	Determination of absorption maxima and effect of solvents on absorption	04
2.	Estimation of dextrose by colorimetry	04
	Estimation of sulfanilamide by colorimetry	04
4.	Simultaneous estimation of ibuprofen and paracetamol by UV	04
5.	Assay of paracetamol by UV- Spectrophotometry	04
6.	Estimation of quinine sulfate by fluorimetry	04
	Study of quenching of fluorescence	04
8.	Determination of sodium by flame photometry	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Instrumental Methods of Chemical Analysis	B.K Sharma	Nirali Publications
Organic spectroscopy	Y.R Sharma	Penton Publications

Reference Book(s):

Title	Author/s	Publication
Organic spectroscopy	William Kemp	Zort Press

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE4020	**PHARMACEUTICAL INSTRUMENTAL ANALYSIS**
CO 1	Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.
CO 2	Understand the chromatographic separation and analysis of drugs
CO 3	Perform quantitative & qualitative analysis of drugs using various analytical instruments.
CO 4	understand selected instrumental analytical techniques (spectroscopic and chromatographic methods) and differentiate with volumetric analysis.

Mapping of CO with PO

SEPE4020	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	1	1	1	1	2	2	1	2	1	1	1
CO 2	1	2	1	1	3			1		2		2
CO 3	1	1	1	2	1	2	2		1	2	3	2
CO 4	2	2	2	2	2	2	1	1	2	1	1	1

Mapping of CO with PSO

SEPE4020	PSO1	PSO2	PSO3
CO 1	2	2	2
CO 2	2	2	
CO 3	1	1	1
CO 4	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	UV Visible spectroscopy	1,2
2	Fluorimetry	1,2,5
3	IR spectroscopy	1,5
4	Gas chromatography	1,3,5
5	Introduction to chromatography	1,2
6	Ion exchange chromatography	1,2,5

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE4030
Course Name: Dosage Formulation Design
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	40	60	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To provide basics of regulatory requirements of pharmaceuticals.
- To provide basics of good manufacturing practices, scientific and risk-based product development approached, validations and regulatory requirements of pharmaceuticals

Course Content:

Section I			
Module No.	**Content**	**Hours**	**Weightage in %**
1.	**Preformulation studies:** a) Study of physical properties of drug like physical form, particle size, shape, density, wetting, dielectric constant, dissolution and organoleptic property and their effect on formulation, stability and bioavailability. b) Study of chemical properties of drugs like hydrolysis, oxidation, reduction, polymorphisms, racemization, polymerization etc., and their influence on formulation and stability of products. c) Study of prodrugs in solving problems related to stability, bioavailability and elegance of formulations.	10	20
2.	**Pharmaceutical necessities:** Study of following adjuvant in pharmaceutical products: Natural Gums, bio degradable polymers, semi-synthetic cellulosic derivatives, and polymers for achieving modified drug release.	06	15
3.	**Stability of pharmaceuticals:** a) Kinetic principles and stability testing: Reaction rate and order, acid base catalysis, decomposition reactions and stabilization of pharmaceuticals. b) Stability of formulation, factors affecting formulation stability, MKT, climatic zones, matrixing and bracketing instability study, accelerated stability testing, real time stability. Current WHO, USFDA and	06	15

	stability testing as per ICH guidelines for pharmaceutical drug substances and drug products. c) Product stability: Requirements, shelf-life, overages, containers, closures. d) Overage calculations		
Section II			
Module No.	**Content**	**Hours**	**Weightage in %**
4.	**Biopharmaceutics:** a) Introduction to biopharmaceutics and its role in formulation development. b) Passage of drugs across biological barriers (passive diffusion, active transport, facilitated diffusion and pinocytosis. c) Factors influencing absorption, - physiochemical, physiological and pharmaceutical. d) Drug distribution in the body, plasma protein binding and drug excretion	08	20
5.	**Bioavailability and Bioequivalence:** a) Measures of bioavailability, Cmax, tmax and area under the curve (AUC). b) Design of single dose bio-equivalence study and relevant statistics. c) Review of regulatory requirements for conduction of bioequivalent studies	07	15
6.	**Introduction to BCS and dissolution study:** Definition: BCS, BDDCS (Biopharmaceutical Drug Disposition Classification System), Dissolution mechanisms, Factors affecting dissolution, Intrinsic dissolution rate measurement, Dissolution apparatus for various dosage forms, Dissolution profile comparison using model independent method (similarity factor, dissimilarity factor).	08	15
	TOTAL	45	100

Text Book(s):

Title	Author/s	Publication
Applied Biopharmaceutics and Pharmacokinetics	Leon Shargel, Susanna Wu-Pong and Andrew B. C. Yu.	McGraw-Hill Education, 2015
The Theory and Practice of Industrial Pharmacy	L Lachman, H Lieberman and J Kanig	CBS Publishers & Distributors

Reference Book(s):

Title	Author/s	Publication
Pharmaceutical Preformulation	Carstensen JT	Technomic Publishing Company, Inc., New Holland Avenue, Lancaster, Pennysylvania, USA
Remington's Pharmaceutical Sciences	Linda A. Felton	Mack Publishing Company, Easton, Pennsylvania

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of two assignment which consists of 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After completion of the course, the students will be able to:

SEPE4030	**DOSAGE FORMULATION DESIGN**
CO 1	Classify different dosage forms and apply principles of pharmaceutical science in formulation and dispensing the various dosage forms.
CO 2	Explain various unit operations in the design and manufacture of dosage forms and describe preventive measures of corrosion and concept of fluid flow
CO 3	Develop dosage form and related concern for design of capsule dosage form.
CO 4	Evaluate the quality of different dosage form as per I.P. monographs.

Mapping of CO with PO

SEPE4030	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2	2	1	1	3	1	3	3	3	2	3
CO 2	2	1	2	2	3	3	3	3	3	3	2	3
CO 3	2	1	2	2	3	3	3	3	3	3	3	3
CO 4	2		1	1	3	3	1	3	3	3		3

Mapping of CO with PSO

SEPE4030	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	3	3	3
CO 4		2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Preformulation studies	1,2,3
2	Pharmaceutical necessities	1,2,4
3	Stability of pharmaceuticals	1,2,4
4	Biopharmaceutics	1,2,4,5
5	Bioavailability and Bioequivalence	1,2,5
6	Introduction to BCS and dissolution study	1,2,3,4,5

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE4040
Course Name: Computer Application in Pharmaceutical Engineering
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	02	--	04	40	60	50	--	--	--	150

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To know the introduction Database, Database Management system, computer application in clinical studies and use of databases.
- know the various applications of databases in pharmacy

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	**Number system**: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division.	10	20
2.	**Concept of Information Systems and Software:** Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.	10	20
3.	**Web technologies**: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database.	03	10
Section II			
Module No.	Content	Hours	Weightage in %
4.	**Application of computers in Pharmacy** – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile	10	20

	technology and adherence monitoring Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System		
5.	**Bioinformatics:** Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery	05	20
6.	**Computers as data analysis in Preclinical development**: Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)	08	10
	TOTAL	45	100

List of Experiments

Sr. No.	Experiment List	Hours
1.	Design a questionnaire using a word processing package to gather information	04
2.	Create a HTML web page to show personal information.	04
	Retrieve the information of a drug and its adverse effects using online	04
4.	Creating mailing labels Using Label Wizard , generating label in MS	04
5.	Design a form in MS Access to view, add, delete and modify the patient	04
6.	Generating report and printing the report from patient database	04
	Creating invoice table using – MS Access	04
8.	Drug information storage and retrieval using MS Access	02
	TOTAL	30

Text Book(s):

Title	Author/s	Publication
Computer Application in Pharmaceutical Research and Development –	Sean Ekins – Wiley-Interscience	A John Willey and Sons, INC., Publication, USA

Reference Book(s):

Title	Author/s	Publication
Bioinformatics (Concept, Skills and Applications)	S.C.Rastogi	CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)

Course Evaluation:

Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.
- End Semester Examination will consist of 60 Marks Exam.

Course Outcome(s):

After the completion of the course, the students will be able to:

SEPE4040	COMPUTER APPLICATION IN PHARMACEUTICAL ENGINEERING
CO 1	Understand different types of databases, applications of computers and databases in pharmacy.
CO 2	Illustrate the concept of number system in computers.
CO 3	Understand web technologies such as HTML, XML, CSS, programming languages, Web servers and pharmacy drug database.
CO 4	Explain about bioinformatics and its impact in vaccine discovery.

Mapping of CO with PO

SEPE4040	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	2	2	3	3		2		2	2	2	1
CO 2	1	1	2	1	2		2		1	1	2	1
CO 3		1	2	2	3		2		2	1		1
CO 4	1	2	2	2	3		2		2	2	2	1

Mapping of CO with PSO

SEPE4040	PSO1	PSO2	PSO3
CO 1	1	2	3
CO 2		1	
CO 3	1	1	1
CO 4	1	2	1

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	Content	RBT Level
1	Number system	1,2,3
2	Concept of Information Systems and Software	1,2
3	Web technologies	1,2,3
4	Web technologies	1,2,3
5	Application of computers in Pharmacy	1,4
6	Bioinformatics	1,3
7	Computers as data analysis in Preclinical development	1,2

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE4910
Course Name: Industry Aligned Learning-V
Prerequisite Course/s: --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
03	--	--	03	100	--	--	--	--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Objective(s) of the Course:
To help learners to

- To give idea to the students related to documentation and records, laboratory practices and engineering practices.
- Know the principles of problem solving related to pharma industry.

Course Content:

Section I			
Module No.	Content	Hours	Weightage in %
1.	Documentation and Records	20	30
2.	Project Management for Pharmaceutical Industry	10	20
Section II			
Module No.	Content	Hours	Weightage in %
3.	Statistical and Problem-Solving Tools for continual improvement	15	50
	TOTAL	**45**	**100**

Text Book(s):

Title	**Author/s**	**Publication**
ICH Guideline Q10	Global Society	Indian Press

Course Evaluation:
Theory:

- Continuous Evaluation consists of Two Test Each of 30 Marks and 1 Hour of duration.
- Submission of assignment which consists of 5 Questions to be answered under each module and it carries 10 Marks of Evaluation.

Course Outcome(s):
After the completion of the course, the students will be able to:

SEPE4910	**INDUSTRY ALIGNED LEARNING-V**

CO 1	Generate competency in accordance with current regulatory guidelines related to documentations.
CO 2	Relate the basic concepts and fundamentals of pharmaceutical industry.
CO 3	Implement various aspects of project management.
CO 4	Illustrate the concepts of Statistical and Problem-Solving Tools.

Mapping of CO with PO

SEPE4910	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1		1	1	1	1	2	2	3		1	2	1
CO 2		2	1	1	1		1			3	1	1
CO 3		1	1	1		3	1	1	3	1	3	1
CO 4	3	3	2	2	3					1		1

Mapping of CO with PSO

SEPE4910	PSO1	PSO2	PSO3
CO 1	1	2	1
CO 2	3	2	3
CO 3	1	2	2
CO 4	2	2	2

Level of Bloom's Revised Bloom's Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create

Module No	**Content**	**RBT Level**
1	Documentation and Records	1,2,3
2	Project Management for Pharmaceutical Industry	1,2,3
3	Statistical and Problem-Solving Tools for continual improvement	1,2,3

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE4920
Course Name: Project/Summer Internship
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
--	05	--	05	--	--	100		--	--	100

CE: Continuous Evaluation, ESE: End Semester Exam

Outline of the Course:

Project

- The project will be aligned with the aims of the engineering programme and its areas of specialization and shall be based on the recent trends in technology.
- The student shall carry out a comprehensive project at relevant academic / R&D / industrial organization.
- The student is required to submit a project report based on the work carried out.

Training

- The aim of this course is to use the internship experience to enable students to develop their engineering skills and practices.
- The student will be placed in industry/organization for 12 to 18 weeks and assessed for academic credit.
- The students may select industry on their own or one which is offered by institute.
- Students are expected to experience a real-life engineering workplace and understand how their engineering and professional skills can be utilized in industry.
- The student is required to submit a project report based on the work carried out.

Course Outcome(s):

After completion of the course, the students will be able to

SECH4920	PROJECT / SUMMER INTERNSHIP
CO 1	Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
CO 2	Determine the challenges and future potential for his/her internship organization in particular and the sector in general.
CO 3	Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
CO 4	Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.
CO 5	Analyze the functioning of internship organization and recommend changes for improvement in processes.

Mapping of CO with PO:

SEPE4920	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	2	3	3	3	3	3	3	3	1	2
CO 2	2	3	2	3	3	3	3	3	3	3	1	2
CO 3	2	3	2	3	3	3	3	3	3	3	1	3
CO 4	2	3	2	3	3	3	3	3	3	3	1	2
CO 5	2	3	2	3	3	3	3	3	3	3	1	3

Mapping of CO with PSO

SEPE4920	PSO1	PSO2	PSO3
CO 1	3	3	3
CO 2	3	3	3
CO 3	1	3	3
CO 4			
CO 5	3	3	3

P P Savani University
School of Engineering
Department of Pharmaceutical Engineering

Course Code: SEPE4930
Course Name: Project/Training
Prerequisite Course(s): --

Teaching & Examination Scheme:

Teaching Scheme (Hours/Week)				Examination Scheme (Marks)						
Theory	Practical	Tutorial	Credit	Theory		Practical		Tutorial		Total
				CE	ESE	CE	ESE	CE	ESE	
--	17	--	17	--	--	200	300	--	--	500

CE: Continuous Evaluation, ESE: End Semester Exam

Outline of the Course:

Project

- The project will be aligned with the aims of the engineering programme and its areas of specialization and shall be based on the recent trends in technology.
- The student shall carry out a comprehensive project at relevant academic / R&D / industrial organization.
- The student is required to submit a project report based on the work carried out.

Training

- The aim of this course is to use the internship experience to enable students to develop their engineering skills and practices.
- The student will be placed in industry/organization for 12 to 18 weeks and assessed for academic credit.
- The students may select industry on their own or one which is offered by institute.
- Students are expected to experience a real-life engineering workplace and understand how their engineering and professional skills can be utilized in industry.
- The student is required to submit a project report based on the work carried out.

Course Outcome(s):

After completion of the course, the students will be able to

SEPE4930	**PROJECT / TRAINING**
CO 1	Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
CO 2	Determine the challenges and future potential for his/her internship organization in particular and the sector in general.
CO 3	Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
CO 4	Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.
CO 5	Analyze the functioning of internship organization and recommend changes for improvement in processes.

Mapping of CO with PO

SEPE4930	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	2										
CO 2		1	1		3	2	3	3	3	2	2	1
CO 3		2	1	2	1		1	1				1
CO 4								3	2	3	2	2
CO 5		1	1	2	3		1		2	1	2	

Mapping of CO with PSO

SEPE4930	PSO1	PSO2	PSO3
CO 1	2	1	
CO 2	1	2	1
CO 3	2	1	1
CO 4	3	2	3
CO 5	2	3	3