

2018

**[OBE DESIGN- ABC  
DEPARTMENT]**

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## PREFACE

Outcome Based Education (OBE) is the educational approach which focuses on student centric education in the context of development of personal, social, professional and knowledge (KSA) requirements in one's career and life. It is the decade ago curriculum development methodology. The educational triangle of LEARNING-ASSESSMENT-TEACHING is the unique nature of the OBE approach. The curriculum practices such as Competency Based Curriculum, Taylor's Model of Curriculum Development, Spadys' Curriculum principles, Blooms taxonomy and further use of assessment methodologies like, Norm-reference testing and Criterion reference testing, etc is being practiced since decades. It is also interesting to know that, globally, different countries and universities adopts the curriculum development models/approaches such as, CDIO (Conceive-Design-Implement-Operate), Evidenced Based Education, Systems' Approach, etc as the scientific and systematic approaches in curriculum design.

The authorities of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.) in-lieu of accreditation standards of National Assessment and Accreditation Council, decided to opt for Outcomes Based Education (OBE). As the part of the decision, different meetings, workshops and presentations were held at the campus of university.

This document is the outcome of different meetings and workshops held at university level and department level. The detailed document is designed and the existing curriculum of the department is transformed in to the framework of OBE. This is the first step towards the implementation of OBE in the department. The document will serve all stakeholders in the effective implementation of the curriculum. The OBE is continuous process for quality enhancement and it will go a long way in order to enhance the competencies and employability of the graduates/Post-graduates of the university department.

**Head of Department**

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# OUTCOME BASED EDUCATION

## Faculty of Science & Technology

### Department of Chemical Technology

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#### 1. Mission:

##### Mission Statement

- To offer post-graduate and research program in the domain of chemical technology.
- To develop globally competent scientist and researcher to work in industry and self-enterprise.
- To develop the products, processes and technology in the field of Chemical technology.
- To offer student centric and value based teaching practices and academic environment in the department.

#### 2. Vision:

##### Vision Statement

To develop the learning center in chemical technology that make quality the defining element of education through a combination of self and external evaluation process that leads to promotion and sustenance initiative process.

#### 3. Title of the Program (s):

- a. Master of Chemical Technology/Pharmaceutical Science
- b. Bachelor of Chemical technology/Food Technology/Pharmacutics

#### 4. Program Educational Objectives:

The program educational objectives (PEO) are the statement that describes the career and professional achievement after the program of studies (graduation/ post-graduation). The PEO s are driven form question no. (ii) of the Mission statement ( What is the purpose of organization). The PEOs can be minimum three and maximum five.

### **Masters' Programme**

PEO1: To have advance knowledge and apply theories and principles of chemical /food /pharmaceutical technology in the domain of industry, research and development.

PEO2: To provide the professional services to industry, research organization, institutes.

PEO3: To provide the professional consultancy and research support for the relevant organization in the domain of super specialization.

PEO4: To opt for higher education, disciplinary & multi-disciplinary research and to be a life-long learner.

PEO5: To provide, value based and ethical leadership in the professional and social life.

### **Bachelor Program**

#### **Food Technology**

**PEO 1-** To develop graduates with sound knowledge in the field of food engineering and technology by integrating engineering and basic sciences.

**PEO 2-** To produce competent graduates who shall pursue careers in the field of food processing, quality control, product development and techno-marketing.

**PEO 3-** To inculcate innovative ideas and project management skills in order to make them capable to grow as an entrepreneur.

**PEO 4-** To prepare graduates to apply the technical knowledge and know-how to solve the problems related to food processing and preservation for the benefit of the society.

#### **Chemical Technology/Pharmaceutical Science**

- I. To prepare graduates with basic knowledge in chemical Technology/ Pharmaceutical science and develop our graduates to supervise industry practices.
- II. To prepare and develop the graduates with high order knowledge in design and construction of process plants.
- III. To prepare graduates with the highest level of technical competence with creativity, innovation and leadership skills.
- IV. To opt for higher education and undertake research work.

## 5. Program Outcomes:

The program outcomes (PO) are the statement of competencies/ abilities. POs are the statement that describes the knowledge and the abilities the graduate/ post-graduate will have by the end of program studies.

### **Master of Chemical/ Pharmaceutical Technology**

- I. Apply the advance knowledge of domain in designing, developing and implementing the product, process and system.
- II. An ability to independently carry out research /investigation and development Work to solve practical problems
- III. An ability to write and present a substantial technical report/document
- IV. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
- V. Ability to start own enterprise/professional services.
- VI. Use of sophisticated equipment and technology/tool in experimentation and processes.

### **Bachelors Programme in Food Technology**

- PO1 Graduates will have an ability to apply knowledge of mathematics, food science, food engineering and technology
- PO2 Graduates will have an ability to analysis the problems in food science, food engineering and food processing technology, and will be competent to control problems during foods processing and storage
- PO3 Graduates will have an ability to identify problems and accordingly design to resolve the problems in the actual situations during food processing, food quality controlling, food packaging and storage
- PO4 Graduates will have an ability to express practical proficiency in the field of food analysis, food processing and food preservation
- PO5 Graduates will have advanced knowledge of food microbiology, food science, food engineering , food quality and food processing technology
- PO6 Graduates will have an ability of designing and development of food products as per the need of society keeping the value of food safety and health benefits.
- PO7 Graduates will have an ability to understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of,

and need for sustainable development.

- PO8 Graduates will have an ability to apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- PO9 Graduates will have an ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- PO10 Graduates will have an ability to communicate effectively for self development
- PO11 Graduates will have knowledge and ability of industrial economics and management of food industries
- PO12 Graduates will have an ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
- PSO1 Graduates will apply the knowledge of food chemistry, food preservation, food processing and food packaging for the effective utilization of agricultural commodities to develop healthy and nutritious foods
- PSO2 Graduates will design economically feasible equipment for the modernization of traditional food processing methods**

#### **Bachelors Programme in Chemical Technology/Pharmaceutical Science**

<b>PO1</b>	<b>Domain specific Engineering knowledge</b> : Attainment of the ability to acquire and apply knowledge of mathematics, physics, chemistry, basic engineering sciences and Chemical Engineering specialization so as to make analysis of complex chemical engineering problems.
<b>PO2</b>	<b>Problem Analysis ability</b> : Attainment of the ability to acquire knowledge which will enable them to analyze problems while working in chemical and allied industries as well as consultancies.
<b>PO3</b>	<b>Acquiring skills to Design/develop solutions to problems</b> : Acquiring skills in selection, design, erection and control of unit processes and unit operations and to attain ability to understand the past and present trends in manufacturing, production and marketing of chemically derived products.
<b>PO4</b>	<b>Capacity to investigate complex problems</b> : Attainment of the ability to identify new research areas in chemical engineering and to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions, also to make efforts to come up with striking innovations in the field.
<b>PO5</b>	<b>Modern tool usage</b> : Attainment of the ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools including 'modeling and

	prediction' to complex engineering activities so as to solve advanced engineering problems.
<b>PO6</b>	<b>The engineer's connectivity with society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
<b>PO7</b>	<b>Environment and sustainability awareness:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8</b>	<b>Practicing Ethics and Values:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	<b>Ability to work as an Individual and in team:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>Acquiring Communication Skills:</b> 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.
<b>PO11</b>	<b>Well verse with task of Project management and finance aspects:</b> 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 and in multidisciplinary environments.
<b>PO12</b>	<b>Life-long learning attitude:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
<b>PSO1</b>	<b>Professional skills :</b> Acquiring skills to utilize the knowledge of chemical engineering in innovative, dynamic and challenging environment for design and development of new products, attainment of ability to acquire skills required to help chemical industry through courses like Process Design , Piping Design and the relevant software training
<b>PSO2</b>	<b>Practical implementation and testing skills:</b> Attainment of ability to acquire skills required to help chemical industry. These may be imbibed through courses/workshops on industrial safety & hazard management, hands on training for topics like 'analytical techniques', 'instrumentation' required in chemical and allied industry.
<b>PSO3</b>	<b>Successful career and entrepreneurship:</b> Transformation of the students into technocrats who will design and develop systems and subsystems for Chemical allied Technologies and few of these technocrats may become entrepreneurs also.

## 6. Course- Program outcome Matrix:

The Program Outcomes are developed through the curriculum (curricular/co-curricular-extra-curricular activities). The program outcomes are attained through the course implementation. As an educator, one must know, **"to which POs his/her course in contributing?"**. So that one can design the learning experiences, select teaching method and design the tool for assessment. Hence, establishing the Corse-PO matrix is essential step in the OBE. The course-program outcomes matrix indicates the co-relation between



the courses and program outcomes. The CO-PO matrix is the map of list of courses contributing to the development of respective POs.

The **CO-PO MATRIX** is provided in the below table.

CO-PO MATRIX B.TECH. PHARMA												
	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Mathematics-I	*	*	*									
Engineering Graphics	*	*	*									
Applied Science	*	*	*									
Organic Chemistry-I	*	*	*									
Computer Fundamentals and Programming	*	*	*									
Basic Civil Engineering	*	*	*									
Engineering Mathematics-II	*	*	*									
Physics	*	*	*									
Organic Chemistry-II	*	*	*									
Biological Science	*	*	*									
Basic Mechanical Engineering	*	*	*									
Environment & Ecology	*	*	*									
Basic Electricals & Electronics Engineering	*	*	*									
Physiopharmacology-I		*	*	*								
Medicinal Chemistry-I		*	*	*								
Engineering Mathematics-III		*	*	*								
Lab I - Physiopharmacology-I		*	*	*								
Lab II - Medicinal Chemistry-I		*	*	*								
Lab V-Workshop Technology		*	*	*								
Physiopharmacology-II		*	*	*								
Medicinal Chemistry-II		*	*	*								
Pharmaceutics-I		*	*	*								
Cosmetic Technology		*	*	*								
Lab VIII - Physiopharmacology-II		*	*	*								
Lab IX - Medicinal Chemistry-II		*	*	*								
Lab X- Pharmaceutics-I		*	*	*								
Pharmaceutical Analysis – I		*	*	*								
Pharmacognosy		*	*	*								
Pharmaceutics-II		*	*	*								
Pharmaceutical Biotechnology		*	*	*								
Lab III- Pharmaceutical Analysis - I		*	*	*		*	*	*	*			
Lab IV - Pharmacognosy		*	*	*		*	*	*	*			
Lab V- Pharmaceutics-II		*	*	*		*	*	*	*			
Pharmaceutical Analysis-II		*	*	*								
Phytochemistry		*	*	*								
Physical Pharmacy		*	*	*								
Biopharmaceutics		*	*	*								

Lab VIII - Pharmaceutical Analysis - II		*	*	*		*	*	*	*			
Lab IX - Phytochemistry		*	*	*		*	*	*	*			
Lab X - Physical Pharmaceutics		*	*	*		*	*	*	*			
Phytopharmaceutical Technology		*	*	*								
Elective - Special Technology*		*	*	*		*	*	*	*			
		*	*	*		*	*	*	*			
		*	*	*		*	*	*	*			
		*	*	*		*	*	*	*			
Industrial Safety & Management		*	*	*		*	*	*	*			
Applied Statistics		*	*	*								
		*	*	*								
Lab III - Phytopharmaceutical Technology			*	*	*	*	*	*	*	*	*	*
Lab IV - Special Technology Elective			*	*	*	*	*	*	*	*	*	*
			*	*	*	*	*	*	*	*	*	*
			*	*	*	*	*	*	*	*	*	*
			*	*	*	*	*	*	*	*	*	*
			*	*	*	*	*	*	*	*	*	*
			*	*	*	*	*	*	*	*	*	*
Project - II			*	*	*	*	*	*	*	*	*	*
In-Plant Training			*	*	*	*	*	*	*	*	*	*
In-plant Training Report & Seminar			*	*	*	*	*	*	*	*	*	*
Project Report & Seminar			*	*	*	*	*	*	*	*	*	*

### CO-PO MATRIX B.TECH. CHEMICAL

		CHEMICAL											
		a	b	c	d	e	f	g	h	i	j	k	l
Engineering Mathematics-I	2.6	*	*	*									
Engineering Graphics	3	*	*	*									
Applied Science	1.8	*	*	*									
Organic Chemistry-I	2.6	*	*	*									
Computer Fundamentals and Programming	2	*	*	*									
Basic Civil Engineering	3	*	*	*									
Engineering Mathematics-	1	*	*	*									

II													
Physics	1.8	*	*	*									
Organic Chemistry-II	1.2	*	*	*									
Biological Science	0.2	*	*	*									
Basic Mechanical Engineering	1.2	*	*	*									
Environment & Ecology	1.4	*	*	*									
Basic Electricals & Electronics Engineering	2.2	*	*	*									
Process Calculation	2.2	*	*	*									
Fluid Mechanics	3	*	*	*									
Engineering Mathematics-III	2.2	*	*	*									
Lab III- Fluid Mechanics	1		*	*	*	*	*	*	*	*	*		
Lab IV- Chemical Engineering Thermodynamics	3		*	*	*	*	*	*	*	*	*		
Lab V- Workshop Technology	3		*	*	*	*	*	*	*	*	*		
Process Utilities and Mechanical Operations	3		*	*	*	*	*	*	*	*	*		
Heat Transfer	2.6		*	*	*	*	*	*	*	*	*		
Lab VI - Mechanical Operations	3		*	*	*	*	*	*	*	*	*		
Lab VII - Heat Transfer	3		*	*	*	*	*	*	*	*	*		
Mass Transfer	2.6			*	*	*	*						

Operation													
Industrial Pollution Control	2			*	*	*	*						
Lab I - Mass Transfer Operation	2.6			*	*	*	*						
Lab II - Industrial Pollution Control	2.6			*	*	*	*						
Instrumentation & Process Control	1			*	*	*	*						
Chemical Process Technology	1.8			*	*	*	*						
Lab VI - Instrumentation & Process Control	0.8			*	*	*	*	*	*	*			
Lab VII - Chemical Process Technology	1			*	*	*	*	*	*	*			
Plant Design & Project Engineering	2.2					*	*	*	*	*	*	*	*
Chemical Reaction Engineering	1.2					*	*	*	*	*	*	*	*
Food Analysis	1.8					*	*	*	*	*	*	*	*
Phytopharmaceutical Technology	1.4					*	*	*	*	*	*	*	*
Elective - Special Technology*	0.2					*	*	*	*	*	*	*	*
	0					*	*	*	*	*	*	*	*
	0.2					*	*	*	*	*	*	*	*
	0.2					*	*	*	*	*	*	*	*
Industrial Safety & Management	2.6					*	*	*	*	*	*	*	
Applied	2.6					*	*	*	*	*	*	*	

Statistics													
Lab II - Chemical Reaction Engineering	2.2					*	*	*	*	*	*	*	*
Lab IV - Special Technology Elective						*	*	*	*	*	*	*	*
	0.2					*	*	*	*	*	*	*	*
	0					*	*	*	*	*	*	*	*
	1.8					*	*	*	*	*	*	*	*
	0					*	*	*	*	*	*	*	*

### CO-PO MATRIX B. TECH. FOOD

Course Title	CO Attainment Value	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Mathematics-I	2.6	*	*	*									
Engineering Graphics	3	*	*	*									
Applied Science	1.8	*	*	*									
Organic Chemistry-I	2.6	*	*	*									
Computer Fundamentals and Programming	2	*	*	*									
Basic Civil Engineering	3	*	*	*									
Engineering Mathematics-II	1	*	*	*									
Physics	1.8	*	*	*									
Organic Chemistry-II	1.2	*	*	*									
Biological Science	0.2	*	*	*									
Basic Mechanical Engineering	1.2	*	*	*									
Environment & Ecology	1.4	*	*	*									
Basic Electricals & Electronics Engineering	2.2	*	*	*									
Food Microbiology	0.6		*	*	*								
Food Chemistry-I	3		*	*	*								

Engineering Mathematics-III	2.2		*	*	*								
Lab I- Food Microbiology	2.6		*	*	*								
Lab II- Food Chemistry-I	2.2		*	*	*								
Lab V-Workshop Technology	3		*	*	*								
Food Bio-Chemistry and Nutrition	3		*	*	*								
Principles of Food Processing	3		*	*	*								
Food Processing Technology- I (Fruits & Vegetable Processing)	3		*	*	*								
Food Chemistry-II	3		*	*	*								
Lab VIII - Food Bio-Chemistry & Nutrition	3		*	*	*								
Lab IX - Principles of Food Processing	3		*	*	*								
Lab X-Food Processing Technology-I (Fruits & Vegetable Processing)	3		*	*	*								
Food Packaging Technology	3		*	*	*								
Food Processing Technology- II (Milk & Milk Products)	1.8		*	*	*								
Food Processing Technology-III (Cereal, legume & oil seeds Processing)	2		*	*	*								
Food Biotechnology	2.6		*	*	*								
Lab III - Food Packaging Technology	3		*	*	*		*	*	*	*			
Lab IV - Food Processing Technology- II	3		*	*	*		*	*	*	*			

(Milk & Milk Products)													
Lab V- Food Processing Technology-III (Cereal, legume & oil seeds Processing)	2.6		*	*	*		*	*	*	*			
Food Processing Technology-IV (Spices and flavor Tech.)	3		*	*	*								
Bakery & Confectionary Technology	0.6		*	*	*								
Food Safety and quality	3		*	*	*								
Food Processing Technology-V (Meat, fish & Poultry Processing)	2.6		*	*	*								
Lab VIII - Food Processing Technology-IV (Spices and flavor Tech.)	0.4		*	*	*		*	*	*	*			
Lab IX - Bakery & Confectionary Technology	1.8		*	*	*		*	*	*	*			
Lab X - Food Safety and Quality	2.8		*	*	*		*	*	*	*			
Food Analysis	1.8		*	*	*								
Elective - Special Technology*	0.2		*	*	*		*	*	*	*			
	0		*	*	*		*	*	*	*			
	0.2		*	*	*		*	*	*	*			
	0.2		*	*	*		*	*	*	*			
Industrial Safety & Management	2.6		*	*	*		*	*	*	*			
Applied Statistics	2.6		*	*	*								
Lab I-Project –I	2.2			*	*	*	*	*	*	*	*	*	*
Lab II - Chemical Reaction Engineering	2.2			*	*	*	*	*	*	*	*	*	*
Lab III - Food Analysis	3			*	*	*	*	*	*	*	*	*	*

Lab IV - Special Technology Elective			*	*	*	*	*	*	*	*	*	*	*
	0.2		*	*	*	*	*	*	*	*	*	*	*
	0		*	*	*	*	*	*	*	*	*	*	*
	1.8		*	*	*	*	*	*	*	*	*	*	*
	0		*	*	*	*	*	*	*	*	*	*	*
			*	*	*	*	*	*	*	*	*	*	*
Project - II	2		*	*	*	*	*	*	*	*	*	*	*
In-Plant Training	0		*	*	*	*	*	*	*	*	*	*	*
In-plant Training Report & Seminar	0.4		*	*	*	*	*	*	*	*	*	*	*
Project Report & Seminar	1.2		*	*	*	*	*	*	*	*	*	*	*

## 7. Course Outcomes (for all courses):

The course outcomes are the statement that describes the knowledge & abilities developed in the student by the end of course (subject) teaching. The focus is on development of abilities rather than mere content. There can be 5 to 7 course outcomes of any course. These are to be written in the specific terms and not in general. The list of Course Outcomes is the part of **Annexure-C** attached herewith.

## 8. Set Target levels for Attainment of Course Outcomes:

The course outcome attainment is assessed in order to track the graduates' performance w.r.t target level of performance. The CO-PO attainment is the tool used for continuous improvement in the graduates' abilities through appropriate learning & teaching strategies. In order to assess students' performance with respect to abilities (at the end of course teaching/by the end of program) the course outcome attainment are measured/calculated. In order to calculate the program outcome attainment, the course outcome attainment is calculated. Prior to that, the course-program outcome mapping is done.

## 9. Set Target level for Attainment of Program Outcomes:

The program outcome attainment is assessed in order to track the graduates' performance w.r.t target level of performance. The CO-PO attainment is the tool used for continuous improvement in the graduates' abilities through appropriate learning & teaching strategies. In order to assess students' performance with respect to abilities (at the end of course teaching/by the end of program) the course outcome attainment and program outcome attainment is measured/calculated. The program outcome attainment is governed by curricular, co-curricular and extra-curricular activities including the stakeholders' participation. The direct method and indirect method is adopted to calculate the PO attainment. The direct method implies the attainment by course outcomes contributing to



respective program outcomes. And indirect method is the satisfaction/feed-back survey of stakeholders. In order to calculate the program outcome attainment, the course outcome attainment is calculated. Prior to that, the course-program outcome mapping is done. The set target level is the set benchmark to ensure the continuous improvements in the learners/ graduates' performance.

## 10. Course Attainment Levels:

- a. CO attainment is defined/set at three levels;
- b. The CO attainment is based on end term examination assessment and internal assessment;
- c. The Co attainment is defined at three levels in ascending order-
  - i. e.g. For end term and internal examination;
  - ii. Level-1: 40% students scored more than class average
  - iii. Level-2: 50% students score more than class average;
  - iv. Level-3: 60% students score more than class average.
- d. The target level is set (e.g. Level-2). It indicates that, the current target is level-2; 50% students score more than class average. The CO attainment is measured and the results are obtained. Based on the results of attainment, the corrective measures/remedial action are taken.
- e. CO Attainment= 80% (Attainment level in end term examination) + 20% (Attainment level in internal examination).
- f. **The example for calculation CO attainment is explained in in Point No. 12 for one representative course.**

## 11. Program attainment Level:

- a. PO attainment is defined at five levels in ascending order;
- b. The PO attainment is based on the average attainment level of corresponding courses (Direct Method) and feed-back survey (Indirect method);
- c. The PO attainment levels are defined / set as stated below;
  - i. Level-1: Greater than 0.5 and less than 1.0 (0.5>1)- Poor
  - ii. Level-2: 1.0>1.5-Average
  - iii. Level-3: 1.5>2.0-Good
  - iv. Level-4: 2.0>2.5-Very Good
  - v. Level-5: 2.5>3.0 -Excellent
- d. The PO attainment target level is set/defined (say, Level-3). It implies that, the department is aiming at minimum level-3 (good) in the performance of abilities by the graduates. Based upon the results of attainment, the remedial measures are taken;
- e. PO Attainment= 80% (Average attainment level by direct method) + 20% (Average attainment level by indirect method).
- f. **The example for calculation PO attainment is explained in in Point No. 13 for one representative PO.**

## 12. The Results of CO Attainment:

The summary of Results of CO-PO attainment is provided in Annexure-B.

**FOR EXAMPLE:**

**COURSE CODE/TITLE: BSH-105**

e.g. For end term and internal examination;

- i. Level-1: 40% students scored more than class average
- ii. Level-2: 50% students score more than class average; iv.
- iii. Level-3: 60% students score more than class average

Average Marks in External examination: 41.90 = i.e. 42

% Students score more than 42 is 50 % i.e. Level-2

Average Marks in Internal examination= 10.40= i.e. 10.00

% Students score more than 10.00 is 54.16 %, i.e. Level-2

A(CO) BSH-105= 80% (2)+20% (2)

$$=1.6+0.4$$

$$=2.00$$

**Hence**, the attainment level is Level-2 and the set target level is Level-2 and therefore the CO is fully attained.

**Table No. 1.0: CO Attainment Level**

### **B.TECH. PHARMA**

Course Title	CO Attainment Value	Target Attainment Level	Fully attained/ Not attained	Remedial Measures
Engineering Mathematics-I	2.6	2	Fully attained	
Engineering Graphics	3	2	Fully attained	
Applied Science	2.2	2	Fully attained	
Organic Chemistry-I	2.6	2	Fully attained	
Computer Fundamentals and Programming	2	2	Fully attained	
Basic Civil Engineering	3	2	Fully attained	
Engineering Mathematics-II	1	2	Not attained	Assignment, tutorials, exercise, remedial

Physics	1.8	2	Not attained	coaching.
Organic Chemistry-II	1.2	2	Not attained	
Biological Science	0.2	2	Not attained	
Basic Mechanical Engineering	1.2	2	Not attained	
Environment & Ecology	1.4	2	Not attained	
Basic Electricals & Electronics Engineering	2.2	2	Fully attained	
Physiopharmacology-I	2.2	2	Fully attained	
Medicinal Chemistry-I	2	2	Fully attained	
Engineering Mathematics-III	2.2	2	Fully attained	
Lab I - Physiopharmacology-I	1.2	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Lab II - Medicinal Chemistry-I	3	2	Fully attained	
Lab V-Workshop Technology	3	2	Fully attained	
Physiopharmacology-II	1.4	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Medicinal Chemistry-II	2.2	2	Fully attained	
Pharmaceutics-I	1.4	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Cosmetic Technology	1.2	2	Not attained	
Lab VIII - Physiopharmacology-II	1.2	2	Not attained	
Lab IX - Medicinal Chemistry-II	1.4	2	Not attained	
Lab X- Pharmaceutics-I	2	2	Fully attained	
Pharmaceutical Analysis – I	2.8	2	Fully attained	
Pharmacognosy	2.2	2	Fully attained	
Pharmaceutics-II	1.2	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Pharmaceutical Biotechnology	2.6	2	Fully attained	
Lab III- Pharmaceutical Analysis - I	1.4	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Lab IV - Pharmacognosy	3	2	Fully attained	

Lab V- Pharmaceutics-II	1.4	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Pharmaceutical Analysis-II	1.4	2	Not attained	
Phytochemistry	2.2	2	Fully attained	
Physical Pharmacy	1.2	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Biopharmaceutics	1.2	2	Not attained	
Lab VIII - Pharmaceutical Analysis - II	0.6	2	Not attained	
Lab IX - Phytochemistry	2.2	2	Fully attained	
Lab X - Physical Pharmaceutics	2.6	2	Fully attained	
Phytopharmaceuti cal Technology	1.4	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
Elective - Special Technology*	0.2	2	Not attained	
	0	2	Not attained	
	0.2	2	Not attained	
	0.2	2	Not attained	
Industrial Safety & Management	2.6	2	Fully attained	
Applied Statistics	2.6	2	Fully attained	
	3	2	Fully attained	
Lab III - Phytopharmaceuti cal Technology	0-3	2	Not attained	Assignment, tutorials, exercise, remedial coaching. Assignment, tutorials, .
Lab IV - Special Technology Elective		2	Not attained	
	0.2	2	Not attained	
	0	2	Not attained	
	1.8	2	Not attained	
	0	2	Not attained	
	2	Fully attained		
Project - II	3	2	Fully attained	
In-Plant Training	1.2	2	Not attained	Assignment, tutorials, exercise, remedial coaching.
In-plant Training Report & Seminar	0.8	2	Not attained	
Project Report & Seminar	2.6	2	Fully attained	

**B.TECH. CHEMICAL**

		CO Attainment Value	Target Attainment Level	Fully attained/ Not attained	Remedial Measures
BSH-101	Engineering Mathematics-I	2.6	2	Fully attained	
BED-102	Engineering Graphics	3	2	Fully attained	
BSH-103	Applied Science	1.8	2	Not attained	Assignment, tutorial, exercise, remedial coaching
BSH-104	Organic Chemistry-I	2.6	2	Fully attained	
BSH-105	Computer Fundamentals and Programming	2	2	Fully attained	
BED-106	Basic Civil Engineering	3	2	Fully attained	
BSH-151	Engineering Mathematics-II	1	2	Not attained	Assignment, tutorial, exercise, remedial coaching
BSH-152	Physics	1.8	2	Not attained	
BSH-153	Organic Chemistry-II	1.2	2	Not attained	
BSH-154	Biological Science	0.2	2	Not attained	
BED-155	Basic Mechanical Engineering	1.2	2	Not attained	
SCD-191	Environment & Ecology	1.4	2	Not attained	
BED-201	Basic Electricals & Electronics Engineering	2.2	2	Fully attained	
CED-202	Process Calculation	2.2	2	Fully attained	
CED-203	Fluid Mechanics	3	2	Fully attained	
BSH-206	Engineering Mathematics-III	2.2	2	Fully attained	
CED-223	Lab III- Fluid Mechanics	1	2	Not attained	Assignment, tutorial, exercise, remedial coaching
CED-224	Lab IV- Chemical Engineering Thermodynamics	3	2	Fully attained	
BED-225	Lab V-Workshop Technology	3	2	Fully attained	
CED-251	Process Utilities and Mechanical Operations	3	2	Fully attained	
CED-252	Heat Transfer	2.6	2	Fully attained	

CED-271	Lab VI - Mechanical Operations	3	2	Fully attained	
CED-272	Lab VII - Heat Transfer	3	2	Fully attained	
CED-301	Mass Transfer Operation	2.6	2	Fully attained	
CED-302	Industrial Pollution Control	2	2	Fully attained	
CED-321	Lab I - Mass Transfer Operation	2.6	2	Fully attained	
CED-322	Lab II - Industrial Pollution Control	2.6	2	Fully attained	
CED-351	Instrumentation & Process Control	1	2	Not attained	Assignment, tutorial, exercise, remedial coaching
CED-352	Chemical Process Technology	1.8	2	Not attained	
CED-371	Lab VI - Instrumentation & Process Control	0.8	2	Not attained	
CED-372	Lab VII - Chemical Process Technology	1	2	Not attained	
CED-401	Plant Design & Project Engineering	2.2	2	Fully attained	
CED-402	Chemical Reaction Engineering	1.2	2	Not attained	Assignment, tutorial, exercise, remedial coaching
FTD-403	Food Analysis	1.8	2	Not attained	
PTD-403	Phytopharmaceutical Technology	1.4	2	Not attained	
ELFT-405	Elective - Special Technology*	0.2	2	Not attained	
ELFT-406		0	2	Not attained	
ELPT-404		0.2	2	Not attained	
ELPT-405		0.2	2	Not attained	
SCD-441	Industrial Safety & Management	2.6	2	Fully attained	
SCD-442	Applied Statistics	2.6	2	Fully attained	
CED-422	Lab II - Chemical Reaction Engineering	2.2	2	Fully attained	
ELFT-424	Lab IV - Special Technology Elective				
ELFT-425		0.2	2	Not attained	Assignment, tutorial, exercise, remedial coaching
ELFT-		0	2	Not attained	

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ELPT-424		1.8	2	Not attained	
ELPT-425		0	2	Not attained	
ELPT-426		2	2	Fully attained	

### B. TECH. FOOD TECHNOLOGY

<b>Course Title</b>	<b>CO Attainment Value</b>	<b>Target Attainment Level</b>	<b>Fully Attained/ Not attained</b>	<b>Remedial Measures</b>
Engineering Mathematics-I	2.6	2	<b>Fully Attained</b>	
Engineering Graphics	3	2	<b>Fully Attained</b>	
Applied Science	1.8	2	<b>Not Attained</b>	Assignment, tutorial, exercise, remedial coaching
Organic Chemistry-I	2.6	2	<b>Fully Attained</b>	
Computer Fundamentals and Programming	2	2	<b>Fully Attained</b>	
Basic Civil Engineering	3	2	<b>Fully Attained</b>	
Engineering Mathematics-II	1	2	<b>Not Attained</b>	Assignment, tutorial, exercise, remedial coaching
Physics	1.8	2	<b>Not Attained</b>	
Organic Chemistry-II	1.2	2	<b>Not Attained</b>	
Biological Science	0.2	2	<b>Not Attained</b>	
Basic Mechanical Engineering	1.2	2	<b>Not Attained</b>	
Environment & Ecology	1.4	2	<b>Not Attained</b>	
Basic Electricals & Electronics Engineering	2.2	2	<b>Fully Attained</b>	
Food Microbiology	0.6	2	<b>Not Attained</b>	Assignment, tutorial, exercise, remedial coaching
Food Chemistry-I	3	2	<b>Not Attained</b>	
Engineering Mathematics-III	2.2	2	<b>Fully Attained</b>	
Lab I- Food Microbiology	2.6	2	<b>Fully Attained</b>	
Lab II- Food Chemistry-I	2.2	2	<b>Fully Attained</b>	

Lab V-Workshop Technology	3	2	<b>Fully Attained</b>	
Food Bio-Chemistry and Nutrition	3	2	<b>Fully Attained</b>	
Principles of Food Processing	3	2	<b>Fully Attained</b>	
Food Processing Technology- I (Fruits & Vegetable Processing)	3	2	<b>Fully Attained</b>	
Food Chemistry-II	3	2	<b>Fully Attained</b>	
Lab VIII - Food Bio-Chemistry & Nutrition	3	2	<b>Fully Attained</b>	
Lab IX - Principles of Food Processing	3	2	<b>Fully Attained</b>	
Lab X-Food Processing Technology-I (Fruits & Vegetable Processing)	3	2	<b>Fully Attained</b>	
Food Packaging Technology	3	2	<b>Fully Attained</b>	
Food Processing Technology- II (Milk & Milk Products)	1.8	2	<b>Not Attained</b>	Assignment, tutorial, exercise, remedial coaching
Food Processing Technology-III (Cereal, legume & oil seeds Processing)	2	2	<b>Fully Attained</b>	
Food Biotechnology	2.6	2	<b>Fully Attained</b>	
Lab III - Food Packaging Technology	3	2	<b>Fully Attained</b>	
Lab IV - Food Processing Technology- II (Milk & Milk Products)	3	2	<b>Fully Attained</b>	
Lab V- Food Processing Technology-III (Cereal, legume & oil seeds Processing)	2.6	2	<b>Fully Attained</b>	
Food Processing Technology-IV (Spices and flavor Tech.)	3	2	<b>Fully Attained</b>	
Bakery & Confectionary Technology	0.6	2	<b>Not Attained</b>	Assignment, tutorial, exercise, remedial coaching
Food Safety and quality	3	2	<b>Fully Attained</b>	



Food Processing Technology-V (Meat, fish & Poultry Processing)	2.6	2	<b>Fully Attained</b>	
Lab VIII - Food Processing Technology-IV (Spices and flavor Tech.)	0.4	2	<b>Not Attained</b>	Assignment, tutorial, exercise, remedial coaching
Lab IX - Bakery & Confectionary Technology	1.8	2	<b>Not Attained</b>	
Lab X - Food Safety and Quality	2.8	2	<b>Fully Attained</b>	
Food Analysis	1.8	2	<b>Not Attained</b>	Assignment, tutorial, exercise, remedial coaching
Elective - Special Technology*	0.2	2	<b>Not Attained</b>	
	0	2	<b>Not Attained</b>	
	0.2	2	<b>Not Attained</b>	
Industrial Safety & Management	2.6	2	<b>Fully Attained</b>	
Applied Statistics	2.6	2	<b>Fully Attained</b>	
Lab I-Project –I	2.2	2	<b>Fully Attained</b>	
Lab II - Chemical Reaction Engineering	2.2	2	<b>Fully Attained</b>	
Lab III - Food Analysis	3	2	<b>Fully Attained</b>	
Lab IV - Special Technology Elective				Assignment, tutorial, exercise, remedial coaching
	0.2	2	<b>Not Attained</b>	
	0	2	<b>Not Attained</b>	
	1.8	2	<b>Not Attained</b>	
	0	2	<b>Not Attained</b>	
Project - II	2	2	<b>Not Attained</b>	
In-Plant Training	0	2	<b>Not Attained</b>	
In-plant Training Report & Seminar	0.4	2	<b>Not Attained</b>	
Project Report & Seminar	1.2	2	<b>Not Attained</b>	

### 13.The Results of PO Attainment:

The summary of Results of CO-PO attainment is provided in Annexure-B.

**FOR EXAMPLE:**

**PO NO.: e (PHARMA)**

(Note: Refer point No. 11 above which describes the attainment level and set target attainment level)

PO Attainment= 80% (Average attainment level by direct method) + 20% (Average attainment level by indirect method).

$$A (PO) a= 80\% (0.3+0.2+0+1.8+0+3+1.2+0.8+2.6)/9 +20\% (1.2)$$

$$= 80\% (1.2) + 20\% (1.2)$$

$$= 1.2 \text{ i.e. Level-2. Target Level is Level-3}$$

Hence PO is Not Attained.

**Table No. 2.0 PO Attainment Level**

**BACHELOR OF TECHNOLOGY PHARMA**

<b>PO/PSO number</b>	<b>PO Attainment Value</b>	<b>Target Attainment level</b>	<b>Fully attained/ Not Attained</b>	<b>Remedial Measures</b>
a	1.88	3	Fully attained	
b	1.79	3	Fully attained	
c	1.69	3	Fully attained	
d	1.64	3	Fully attained	
e	1.2	3	Not attained	Assignment, tutorials, exercise and remedial coaching for corresponding courses.
f	1.29	3	Not attained	
g	1.29	3	Not attained	
h	1.29	3	Not attained	
i	1.29	3	Not attained	
j	1.2	3	Not attained	
k	1.2	3	Not attained	
i	1.2	3	Not attained	

### BACHELOR OF PHARMA CHEMICAL

PO/PSO number	PO Attainment Value	Target Attainment level	Fully attained/ Not Attained	Remedial Measures
a	1.96	3	Fully attained	
b	2.17	3	Fully attained	
c	2.08	3	Fully attained	
d	2.03	3	Fully attained	
e	1.65	3	Fully attained	
f	1.65	3	Fully attained	
g	1.54	3	Fully attained	
h	1.54	3	Fully attained	
i	1.54	3	Fully attained	
j	1.60	3	Fully attained	
k	1.11	3	Not attained	Assignment, tutorials, exercise and remedial coaching for corresponding courses.
i	1.11	3	Not attained	

### BACHELOR OF TECHNOLOGY FOOD

PO/PSO number	PO Attainment Value	Target level	Fully attained/ Not Attained	Remedial Measures
a	1.85	3	Fully attained	
b	2.09	3	Fully attained	
c	1.9	3	Fully attained	
d	1.92	3	Fully attained	
e	1.00	3	Not Attained	Assignment, tutorials, exercise and remedial coaching for corresponding courses.
f	1.35	3	Fully attained	
g	1.35	3	Fully attained	
h	1.35	3	Fully attained	
i	1.35	3	Fully attained	
j	1.00	3	Not Attained	Assignment, tutorials, exercise and remedial coaching for corresponding courses.
k	1.00	3	Not Attained	
i	1.00	3	Not Attained	

**14.Planned Actions for Course Attainment:**

The course(s) having CO attainment level less than Level-2 (As per the table stated in Point No. 12 ) Shall be address by planning and organizing remedial measures such as assignments, tutorials, exercises and remedial coaching.

**15.Planned Actions for Program Outcome Attainment:**

The PO having PO attainment level less than Level-4 (as per the table stated in Point No. 13) Shall be addressed by planning and organizing remedial measures for the courses corresponding to respective PO (s) such as assignments, tutorials, exercises and remedial coaching.

**ANNEXURE-B**  
**THE SUMMARY OF RESULTS OF CO-PO ATTAINMENT**

<b>B.TECH. PHARMA</b>												
Course	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Mathematics-I	2.6	2.6	2.6									
Engineering Graphics	3	3	3									
Applied Science	2.2	2.2	2.2									
Organic Chemistry-I	2.6	2.6	2.6									
Computer Fundamentals and Programming	2	2	2									
Basic Civil Engineering	3	3	3									
Engineering Mathematics-II	1	1	1									
Physics	1.8	1.8	1.8									
Organic Chemistry-II	1.2	1.2	1.2									
Biological Science	0.2	0.2	0.2									
Basic Mechanical Engineering	1.2	1.2	1.2									
Environment & Ecology	1.4	1.4	1.4									

Basic Electricals & Electronics Engineering	2.2	2.2	2.2									
Physiopharmacology-I		2.2	2.2	2.2								
Medicinal Chemistry-I		2	2	2								
Engineering Mathematics-III		2.2	2.2	2.2								
Lab I - Physiopharmacology-I		1.2	1.2	1.2								
Lab II - Medicinal Chemistry-I		3	3	3								
Lab V-Workshop Technology		3	3	3								
Physiopharmacology-II		1.4	1.4	1.4								
Medicinal Chemistry-II		2.2	2.2	2.2								
Pharmaceutics-I		1.4	1.4	1.4								
Cosmetic Technology		1.2	1.2	1.2								
Lab VIII - Physiopharmacology-II		1.2	1.2	1.2								
Lab IX - Medicinal Chemistry-II		1.4	1.4	1.4								
Lab X- Pharmaceutics-I		2	2	2								

Pharmaceutical Analysis – I		2.8	2.8	2.8								
Pharmacognosy		2.2	2.2	2.2								
Pharmaceutics-II		1.2	1.2	1.2								
Pharmaceutical Biotechnology		2.6	2.6	2.6								
Lab III- Pharmaceutical Analysis - I		2.2	2.2	2.2		2.2	2.2	2.2	2.2			
Lab IV - Pharmacognosy		2	2	2		2	2	2	2			
Lab V- Pharmaceutics-II		2.2	2.2	2.2		2.2	2.2	2.2	2.2			
Pharmaceutical Analysis-II		1.2	1.2	1.2								
Phytochemistry		2.2	2.2	2.2								
Physical Pharmacy		1.2	1.2	1.2								
Biopharmaceutics		1.2	1.2	1.2								
Lab VIII - Pharmaceutical Analysis - II		0.6	0.6	0.6		0.6	0.6	0.6	0.6			
Lab IX - Phytochemistry		2.2	2.2	2.2		2.2	2.2	2.2	2.2			
Lab X - Physical Pharmaceutics		2.6	2.6	2.6		2.6	2.6	2.6	2.6			

Phytopharmaceutical Technology		1.4	1.4	1.4								
Elective - Special Technology*		0.2	0.2	0.2		0.2	0.2	0.2	0.2			
		0	0	0		0	0	0	0			
		0.2	0.2	0.2		0.2	0.2	0.2	0.2			
		0.2	0.2	0.2		0.2	0.2	0.2	0.2			
Industrial Safety & Management		2.6	2.6	2.6		2.6	2.6	2.6	2.6			
Applied Statistics		2.6	2.6	2.6								
		3	3	3								
Lab III - Phytopharmaceutical Technology			0-3	0-3	0-3	0-3	0-3	0-3	0-3	0-3	0-3	0-3
Lab IV - Special Technology Elective												
			0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			0	0	0	0	0	0	0	0	0	0
			1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
			0	0	0	0	0	0	0	0	0	0
Project - II			3	3	3	3	3	3	3	3	3	3
In-Plant Training			1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
In-plant Training Report & Seminar			0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Project Report & Seminar			2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
	<b>1.88</b>	<b>1.78</b>	<b>1.70</b>	<b>1.64</b>	<b>1.2</b>	<b>1.29</b>	<b>1.29</b>	<b>1.29</b>	<b>1.29</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>



PO ATTAINMENT: CHEMICAL													
		a	b	c	d	e	f	g	h	i	j	k	l
Engineering Mathematics-I	2.6	2.6	2.6	2.6									
Engineering Graphics	3	3	3	3									
Applied Science	1.8	1.8	1.8	1.8									
Organic Chemistry-I	2.6	2.6	2.6	2.6									
Computer Fundamentals and Programming	2	2	2	2									
Basic Civil Engineering	3	3	3	3									
Engineering Mathematics-II	1	1	1	1									
Physics	1.8	1.8	1.8	1.8									
Organic Chemistry-II	1.2	1.2	1.2	1.2									
Biological Science	0.2	0.2	0.2	0.2									
Basic Mechanical Engineering	1.2	1.2	1.2	1.2									

Environment & Ecology	1.4	1.4	1.4	1.4									
Basic Electricals & Electronics Engineering	2.2	2.2	2.2	2.2									
Process Calculation	2.2	2.2	2.2	2.2									
Fluid Mechanics	3	3	3	3									
Engineering Mathematics-III	2.2	2.2	2.2	2.2									
Lab III- Fluid Mechanics	1		1	1	1	1	1	1	1	1	1		
Lab IV- Chemical Engineering Thermodynamics	3		3	3	3	3	3	3	3	3	3		
Lab V- Workshop Technology	3		3	3	3	3	3	3	3	3	3		

Process Utilities and Mechanical Operations	3		3	3	3	3	3	3	3	3	3		
Heat Transfer	2.6		2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6		
Lab VI - Mechanical Operations	3		3	3	3	3	3	3	3	3	3		
Lab VII - Heat Transfer	3		3	3	3	3	3	3	3	3	3		
Mass Transfer Operation	2.6			2.6	2.6	2.6	2.6						
Industrial Pollution Control	2			2	2	2	2						
Lab I - Mass Transfer Operation	2.6			2.6	2.6	2.6	2.6						
Lab II - Industrial Pollution Control	2.6			2.6	2.6	2.6	2.6						

Instrumentation & Process Control	1			1	1	1	1						
Chemical Process Technology	1.8			1.8	1.8	1.8	1.8						
Lab VI - Instrumentation & Process Control	0.8			0.8	0.8	0.8	0.8	0.8	0.8	0.8			
Lab VII - Chemical Process Technology	1			1	1	1	1	1	1	1			
Plant Design & Project Engineering	2.2					2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Chemical Reaction Engineering	1.2					1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Food Analysis	1.8					1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8

Phytopharmaceutical Technology	1.4					1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Elective - Special Technology*	0.2					0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	0					0	0	0	0	0	0	0	0
	0.2					0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	0.2					0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Industrial Safety & Management	2.6					2.6	2.6	2.6	2.6	2.6	2.6	2.6	
Applied Statistics	2.6					2.6	2.6	2.6	2.6	2.6	2.6	2.6	
Lab II - Chemical Reaction Engineering	2.2					2.2	2.2	2.2	2.2	2.2	2.2	2.2	
Lab IV - Special Technology Elective	0.2					0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	0					0	0	0	0	0	0	0	
	1.8					1.8	1.8	1.8	1.8	1.8	1.8	1.8	
	0					0	0	0	0	0	0	0	
<b>PO ATTN,</b>		<b>1.9</b>	<b>2.17</b>	<b>2.0</b>	<b>2.03</b>	<b>1.6</b>	<b>1.65</b>	<b>1.54</b>	<b>1.54</b>	<b>1.54</b>	<b>1.6</b>	<b>1.1</b>	<b>1.11</b>

PO ATTAINMENT: FOOD TECHNOLOGY												
Course Title	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Mathematics-I	2.6	2.6	2.6									
Engineering Graphics	3	3	3									
Applied Science	1.8	1.8	1.8									
Organic Chemistry-I	2.6	2.6	2.6									
Computer Fundamentals and Programming	2	2	2									
Basic Civil Engineering	3	3	3									
Engineering Mathematics-II	1	1	1									
Physics	1.8	1.8	1.8									
Organic Chemistry-II	1.2	1.2	1.2									
Biological Science	0.2	0.2	0.2									
Basic Mechanical Engineering	1.2	1.2	1.2									
Environment & Ecology	1.4	1.4	1.4									

Basic Electricals & Electronics Engineering	2.2	2.2	2.2									
Food Microbiology		0.6	0.6	0.6								
Food Chemistry-I		3	3	3								
Engineering Mathematics- III		2.2	2.2	2.2								
Lab I- Food Microbiology		2.6	2.6	2.6								
Lab II- Food Chemistry-I		2.2	2.2	2.2								
Lab V- Workshop Technology		3	3	3								
Food Bio- Chemistry and Nutrition		3	3	3								
Principles of Food Processing		3	3	3								
Food Processing Technology- I (Fruits & Vegetable Processing)		3	3	3								
Food Chemistry-II		3	3	3								
Lab VIII - Food Bio-Chemistry &Nutrition		3	3	3								

Lab IX - Principles of Food Processing		3	3	3								
Lab X-Food Processing Technology-I (Fruits & Vegetable Processing)		3	3	3								
Food Packaging Technology		3	3	3								
Food Processing Technology- II (Milk & Milk Products)		1.8	1.8	1.8								
Food Processing Technology-III		2	2	2								
Lab III - Food Packaging Technology		2.6	2.6	2.6		3	3	3	3			
(Milk & Milk Products)		3	3	3		3	3	3	3			
Lab V- Food Processing Technology-III (Cereal, legume & oil seeds Processing)		2.6	2.6	2.6		2.6	2.6	2.6	2.6			
Food Processing Technology- IV		3	3	3								



(Spices and flavor Tech.)												
Bakery & Confectionary Technology		0.6	0.6	0.6								
Food Safety and quality		3	3	3								
Food Processing Technology-V (Meat, fish & Poultry Processing)		2.6	2.6	2.6								
Lab VIII - Food Processing Technology-IV (Spices and flavor Tech.)		0.4	0.4	0.4		0.4	0.4	0.4	0.4			
Lab IX - Bakery & Confectionary Technology		1.8	1.8	1.8		1.8	1.8	1.8	1.8			
Lab X - Food Safety and Quality		2.8	2.8	2.8		2.8	2.8	2.8	2.8			
Food Analysis		1.8	1.8	1.8								
Elective - Special Technology*		0.2	0.2	0.2		0.2	0.2	0.2	0.2			
		0	0	0		0	0	0	0			
		0.2	0.2	0.2		0.2	0.2	0.2	0.2			
		0.2	0.2	0.2		0.2	0.2	0.2	0.2			
Industrial Safety & Management		2.6	2.6	2.6		2.6	2.6	2.6	2.6			
Applied Statistics		2.6	2.6	2.6								

Lab I-Project -I			2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Lab II - Chemical Reaction Engineering Lab III - Food Analysis			2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Lab IV - Special Technology Elective												
			0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			0	0	0	0	0	0	0	0	0	0
			1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
			0	0	0	0	0	0	0	0	0	0
Project - II			2	2	2	2	2	2	2	2	2	2
In-Plant Training			0	0	0	0	0	0	0	0	0	0
In-plant Training Report & Seminar			0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Project Report & Seminar			1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
<b>PO ATTNMT,</b>	<b>1.85</b>	<b>2.09</b>	<b>1.9</b>	<b>1.92</b>	<b>1</b>	<b>1.35</b>	<b>1.35</b>	<b>1.35</b>	<b>1.35</b>	<b>1</b>	<b>1</b>	<b>1</b>

## ANNEXURE-B

### COURSE OUTCOMES

#### **Advance Pharmaceutical Chemistry**

- Apply the concept of natural chemistry in the identification of natural compounds.
- Analyze and interpret the structural elucidation of compounds of natural origin
- Apply the knowledge of Isolation, purification and characterization of simple chemical constituents from natural source
- Apply the concept of natural chemistry in the development of lead molecules for new drug discovery

#### **Research Methodology**

- To write a separate summary of collected review articles (Maximum 2 pages per article).
- To perform the literature survey on “Anti-cancer/Anti-viral drugs and their oral bioavailability problems “
- To prepare power-point presentation on “Novel Drug Delivery Systems/Analytical tools and techniques used in pharmaceuticals “
- To deliver presentation on “Novel Drug Delivery Systems/Analytical tools and techniques used in pharmaceuticals”
- To prepare power-point presentation on “Extraction techniques available for herbs/Pharmacokinetic drug interactions “
- To deliver presentation on “Extraction techniques available for herbs/ Pharmacokinetic drug interactions”

#### **Formulation Technology**

- Apply the basic knowledge of preformulation parameters for the development of new formulations.
- Explain the concept, Formulation, evaluation and packaging of various semisolid dosage forms.
- Plan and design any experimental work related to manufacturing, packaging and evaluation of liquid dosage form as well as aerosol preparation.

- Perform the collection, processing and storage of biological products like blood and plasma substitutes

### **Pharmaceutical Biotechnology**

- Explain and compare methods for industrial production of low and high molecular pharmaceutical substances by means of biotechnology, such as antibiotics, vaccines and proteins.
- Explain advantages and disadvantages with different production systems, such as bacteria and plant
- Describe the development of the biotechnology (for example gene therapy and stem cell research) and the biotechnological methods .
- Explain the biotechnology role in the society.

### **Pharmaceutical Regulatory Affairs**

- Explain the scope, importance, functions of regulatory affairs;
- Apply drug regulatory strategy and acquire knowledge of regulatory authorities and agencies.
- Explain the types, requirements, content and formats
- Describe the importance and applications of ipr, ipr laws in india, patent legislation and patent prosecution.

### **Advanced Pharmaceutical analysis**

- Apply various analytical techniques to drug analysis and control, e.g. spectroscopic, chromatographic, etc;
- Apply various analytical methods assessing the purity of formulations;
- Assess stability of pharmaceutical products, active ingredients, excipients and compounds like preservatives, taste and smell improving agents;
- Examine the reliability of various techniques in Pharmaceutical Analysis, including statistical processing;
- Examine the application of analytical methods using biological fluids, so that they can be used in Clinical Pharmacy and Toxicology;
- Apply techniques for artificial ageing of pharmaceutical products or active materials, and accelerating ageing techniques
- Demonstrate an understanding of the theory and applications of the most common basic methods of pharmaceutical analysis (NMR spectroscopy, protein x-ray crystallography, mass spectrometry, CD spectroscopy, Atomic Absorption, and chromatographic techniques, GLC, HPLC and HPLC-MS, and computational methods to drug analysis)

### **Pharmaceutical Packing Technology**

- Identify the factors required for successful packaging
- Explain the conversion process of raw materials into packaging components to maximise quality and minimise recalls
- Describe the basics of artwork control allied to the printing processes
- Design for pack security - tamper evidence, child resistance & anti-counterfeiting
- Explain line layout to avoid rogues & optimise production

### **Herbal Drug Technology**

- Describe the general methods of extraction, isolation and purification of phytoconstituents
- Describe screening procedures for Herbal drugs with current innovations in following therapeutic classes
- Explain the Phytochemical study for herbal drug.
- Describe the chemistry and biology of marine natural products
- Describe the Methods involved in monoherbal and Polyherbal formulations
- Explain the procedure and methods for Quality control of finished herbal medicinal products.

### **Bio-Pharmaceutics and pharmacokinetics**

- Explain the basic concepts of pharmacokinetics and biopharmaceutics.
- Describe the different pharmacokinetic models.
- Determine the basic pharmacokinetic parameters that describe drug absorption and disposition.
- Differentiate between compartmental and non-compartmental analysis.
- Identify the physiological, physicochemical and dosage form-related factors that affects drug absorption from different dosage forms.
- Evaluate the in vitro-in vivo correlation for different drug products.

### **Medicinal Chemistry and drug discovery**

- Design a chemical synthesis;
- Describe the sources of drug compounds;
- Describe methods of drug development including design and discovery;

- Explain the relationship between drug's chemical structure and its therapeutic properties;
- Predict a drug's properties based on its structure;
- Describe the factors that affect its absorption, distribution, metabolism, and excretion, and hence the considerations to be made in drug design;
- Describe the common methods of spectroscopic and chromatographic analysis.

### **Quality Assurance and validation**

- Describe the basic concept & principles of quality management
- Describe good manufacturing practices in pharmaceutical industry
- Explain the Documentation related to NDA application, ANDA application
- Implement the concept of statistical quality control  
Describe the validation procedure.

## **B. TECH. PROGRAM**

### **Engineering mathematics-I**

- **Apply** the basic concepts of complex numbers, differential calculus and details of the same.
- Apply the concepts of partial differentiation and differential equations
- Apply the basic concepts of matrices and infinite series.
- Solve problems

### **Engineering Graphics**

- Draw projections of lines, planes, solids, isometric projections and sections of solids including cylinders, cones, prisms and pyramids using AutoCAD
- Demonstrate the Imagination and visualization of the geometric details of engineering objects.
- Translate the geometric information of engineering objects into engineering drawings.
- Use computer aided drafting in their respective engineering field

### **Applied Science**

- Describe the basic concepts of molecular interactions and bonds theory.
- Explain the concepts of chemical kinetics, catalysis, surface chemistry and details of the periodic table.
- Describe the basic concepts of chemical bonding and organometallics

### **Organic Chemistry-1**

- Describe the basic concepts of IUPAC nomenclature and details of the same.
- Explain the concepts of reactions intermediates, types of organic reaction, mechanism of organic reaction and free radical substitution reactions.
- Explain the basic concepts of Nucleophilic substitution reactions and Elimination reactions.
- Demonstrate the concepts of saturated hydrocarbons, Preparation and chemical properties of alcohols, aldehydes, amines, ketones and carboxylic acids.

### **Computer Fundamentals and Programming**

- Describe the basic concepts of computers, programming language, Algorithms and Flowcharts.
- Implement the concepts of C program, decision control structure, the loop and case control structure.

- Explain the basic concepts of arrays, strings, functions, pointers and structures.

### **Basics of Civil Engineering**

- Explain structures found in industries and houses.
- Explain types of foundation.
- Classify floors and roofs.
- Solve simple problems on calculation of levels.
- State the properties and uses of different industrial materials like sand, cement, aggregate etc.

### **Engineering Mathematics-2**

- Apply the basic concepts of linear differential equation, Partial differential equations and details of the same.
- Apply the concepts of Integral calculus, Multiple Integrals and details of the same.
- Apply the basic concepts of curve tracing and Fourier series.
- Solve problems.

### **Physics**

- Explain the applications of physics in engineering.
- Investigation of physical quantities.
- Apply theory of diffraction, polarization and LASER.
- Explain the concept of nuclear physics and modern physics.

### **Organic Chemistry-2**

- Explain the basic concepts of Stereochemistry of organic compounds.
- Describe the concepts of unsaturated hydrocarbons, arenes and aromaticity.
- Explain the basic concepts of Heterocyclic compounds
- Explain the concepts of oxidation and reduction processes.

### **Biological Science**

- **Explain** the concept of a prokaryotic cell.
- Describe the role of carbohydrates proteins and lipids in metabolism.
- Explain concept and importance of major nutrients.
- Describe the concept of culture media.

### **Basics of Mechanical Engineering**

- Explain interrelationship of Mechanical engineering with other fields of science and engineering.



- Explain the basic principles of thermodynamics like conservation of mass, conservation of energy and the second law of thermodynamics.
- Formulate and solve engineering problems involving closed and open systems for both steady state and transient processes.
- Analyze the performance of various power cycles and to identify methods for improving thermodynamic performance.
- Identify and understand the basic manufacturing processes like single and multipoint machining, forming, welding, casting etc.
- Demonstrate basic operational skills in different manufacturing processes like machining, forming, welding, casting, sheet metal operations, pattern making etc

### **Environment and Ecology**

- Explain the environment related activities.
- Describe recycling and recovery of different materials.
- Explain and practice the environmental friendly operations.
- Describe the process to recover the valuables from the waste material.

### **Basics of Electrical & Electronics Engineering**

- Explain the basic concepts of D.C., single phase and three phase A.C. supply and circuits, and solve basic electrical circuit problems
- Explain the basic concepts of transformers and motors used as various industrial drives
- Describe the concept of power factor improvement for industrial installations and concept of most economical power-factor

### **Process Calculations**

- Explain the basic concepts of processes, process variables and multiphase system.
- Describe the concepts of vapor pressure, phase rule, material and energy balances.
- Explain the basic concepts of unsteady state processes, Formation of equations and DOF analysis.

### **Fluid Mechanics**

- Describe the basic concepts of fluid mechanics, properties, units and laws of fluid statics.
- Explain the concepts of flow of fluid, boundary layer and nature of turbulence.
- Apply the basic concepts of conservation laws and momentum, flow past immersed bodies and details of fluid moving machinery and its classification.

## **Food Microbiology**

- Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival
- Explain the significance and activities of microorganisms in food.
- Describe the characteristics of food-borne, water-borne and spoilage microorganisms, and methods for their isolation, detection and identification.
- Explain the effects of fermentation in food production and its influences on the microbiological quality and status of the food product.
- Explain the importance of microbiological quality control programs in food production

## **Physiopharmacology**

- Explain the basic information in anatomy, physiology, pharmacology and drug therapy
- Describe the concepts of different systems in human body.
- Explain the correlation between diseases and anatomy.
- Describe the role of anatomy and physiology in understanding the therapeutics.
- Explain the concepts like ADME, pharmacokinetics, pharmacodynamics, pharmacotherapy, molecular mechanism of drug action etc.
- Describe the physiopharmacology of drugs related to CNS, PNS etc

## **Food Chemistry**

- Explain the chemistry underlying the properties and reactions of various food component.
- Describe the need of food chemistry and efficiency of carbohydrates and protein in the industry.
- Explain the control the major chemical and biochemical (enzymatic) reactions that influence food quality with emphasis on food industry applications.

## **Medicinal Chemistry**

- Explain the basic principles of Medicinal Chemistry of different classes of therapeutic agents.
- Explain the role of Medicinal Chemistry in the development of new drug molecules.
- Describe the correlation between the pharmacology of a disease and its mitigation or cure.
- Use of sophisticated methods and computational tools for the designing of new drug molecules
- Explain the basic fundamentals of medicinal chemistry viz. receptors, drug metabolism, metabolic transformation etc.
- Describe the medicinal chemistry of different category of drugs viz. CNS stimulant, CNS depressants, psychotherapeutics, narcotics, drugs acting on PNS etc.
- Explain the physicochemical properties of drug molecules and various synthetic techniques and their role in the synthesis of active pharmaceutical ingredients or intermediates.

## **Engineering mathematics-III**

- Apply the basic concepts of statistics, Laplace transform .
- Solve the problem of vector calculus and Z-transform.
- Solve problems of probability, numerical techniques and the details of the same.

## **Process Utilities and Mechanical Operations**

- Distinguish between unit operation and process.
- Calculate reduction ratio, critical speed of mill, effectiveness of screen.
- Give example of utilities.
- Identify a unit process and operation.

- State merits and demerits of different equipments used for performing mechanical operations.

### **Heat Transfer**

- Identify and select type of shell and tube exchanger based on TEMA classification.
- Design double pipe heat exchanger, Shell and tube heat exchanger, finned tube and other compact heat exchangers.

### **Food Bio-chemistry and nutrition**

- Describe the changes occurring during various food processing techniques
- Describe the changes during storage and preservation
- Explain the effect of biochemical reactions on nutritional composition of foods.

### **Physiopharmacology-II**

- Describe the process of drugs that act on cells and tissues of the body.
- Describe and correlate between biochemistry, physiology, medicinal chemistry and helps them to underlying conditions for diseases.
- Explain the physiopharmacology of different classes of drugs viz. drugs acting on CVS, drugs acting on respiratory system, drugs acting on kidney etc.
- Explain the physiopharmacological concepts of drugs acting on GIT, chemotherapeutics, hormones, steroids etc.
- Describe the molecular level mechanism of action of a drug molecule.
- Explain the basic concepts of bioassay of drugs, clinical pharmacology etc.

### **Principles of Food Processing**

- Explain the needs for preservation and mechanisms of preservation;
- Describe the importance of the processing and preservation of food;
- Apply preservation principles in food product design
- Enhance the effectiveness of preservation methods and the efficiency of production

## **Medicinal Chemistry-II**

- Describe the concept of drug design and medicinal chemistry of therapeutic agents
- Explain the role of medicinal chemistry in the development of new drug molecules.
- Explain the concepts of drug design, Analogue synthesis versus rational design, discovery of lead compounds, pharmacophoric identification, QSAR, molecular modeling, docking, basic concept of combinatorial chemistry, compound libraries and general techniques used in combinatorial synthesis.
- Explain the history, nomenclature, classification, SAR, mechanism of action, therapeutic uses, adverse effects and recent developments of different category of drugs viz. drugs acting on diuretics, drugs acting on GIT, hormones, steroids etc.
- Describe the mode of action, structural correlation and use of different chemotherapeutic classes of drugs.
- Explain the pharmacology processes.
- Explain the synthetic methodology used for the synthesis of active pharmaceutical ingredients and intermediates.

## **Food Processing Technology-I**

- Describe the different processing technologies for processing of fruits and Vegetables
- Explain the various quality parameters of fruits and vegetables.
- Explain the different technologies for value added food products.

## **Pharmaceutics-I**

- Explain the concept of dosage form, pharmacokinetic parameters and sources of drug information.
- Explain the concepts of unit operations in manufacturing, filtration & clarification and size reduction.
- Describe the concept of size separation, mixing, drying, packaging and labeling.
- Describe and implement the methods of preparations used for monophasic dosage form, biphasic dosage form, solid dosage form & capsule.

## **Food Chemistry-II**

- Explain sensory assessment of flavor and different flavoring compounds.
- Describe the role of different additives and their special attributes with examples.
- Explain plant and animal pigments and technology for retention of colour.
- Describe the concept of enrichment, restorations and fortifications of vitamins and minerals helpful for new product development.
- Explain the health conscious about various toxicants and methods of elimination of the toxicants.

### **Cosmetic Technology**

- Describe the concept of cosmetic science.
- Explain the concepts of ideal requirement & formulation aspects of creams, powders, lipstick. Herbal cosmetics
- Explain the concept of ideal requirement & formulation aspects of shampoos, hair tonics and hair related cosmetic products.
- Explain the concepts of ideal requirement & formulation aspects of deodorants and shaving related products.

### **Mass Transfer Operations**

- Design distillation column and absorption column.
- Estimate rate of mass transfer.
- Evaluate performance of dryer.
- Explain the role of various mass transfer operations in industries.

### **Industrial Pollution Control**

- Carry out primary, secondary and tertiary characterization.
- Draw a plant layout for water treatment and effluent treatment plant.
- Classify various pollutants.
- Explain plume behavior.
- Design techniques for water treatment

### **Food Packaging Technology**

- Explain the packaging materials and its importance in food Industry
- Utilize packaging materials for right application in Food Industry
- Explain and check the Barrier properties of Packaging materials to avoid cross contamination with air, water and printing ink
- Describe the standardize testing methods for packaging material to assure quality
- Explain packaging laws and regulations meeting standards

### **Pharmaceutical Analysis-I**

- Explain the concept of Pharmaceutical Analysis and different analytical techniques.
- Describe the concepts of standardization and significance of the same.
- Explain the concepts of quantitative analysis.
- Explain and perform the concept of different titrimetric methods viz. acid-base, non-aqueous, complexometric and oxidation-reduction titrations.

### **Food processing technology-II**

- Explain physio-chemical properties of milk and its byproducts
- Describe processing methods and its importance in milk based products
- Optimize Technology for processing of milk and its byproducts
- Demonstrate the handling and transportation of milk and milk products.
- Implement preservation techniques and Packaging for dairy products
- Use new technology and develop quality products

### **Pharmacognasy**

- Explain the basic concepts of Pharmacognosy, importance of taxonomy and study of plant cell.
- Describe the sources of crude drugs and cultivation-collection processing of the same.
- Explain the concepts of natural mineral sources of drugs.
- Explain the alternative various systems of medicine practiced in India and studies of traditional drugs.

### **Food processing technology-III**

- Explain the post-harvest practices and losses of food grains
- Suggest/select right post harvest practice for cereals and legumes.
- Explain physicochemical properties of cereals, legumes and oilseeds
- Describe the development of technology for snacks from millets and oilseeds.
- Describe on the development of sweets and savory based products from pulses

### **Pharmaceutics-II**

- Explain the concept of plant site selection, and Factors influencing layout of pharmaceutical plant.
- Describe the concepts of dosage form necessities and additive properties.
- Describe and demonstrate the parenterals and sterile product packaging.
- Describe the concepts of manufacturing of semisolid dosage form.

- Describe the concept of manufacturing and packaging of pharmaceutical aerosol.

### **Food Technology**

Explain the prospectus of Bio-Technology.

Explain different microbial products.

Describe and implement enzyme technology.

Describe the application of biotechnological aspects in food technology.

### **Pharma Biotechnology**

- Explain the concept of plant cell, tissue culture and animal cell culture.
- Describe the concepts of fermentation and recombinant DNA technology.
- Describe the biotechnology derives products, proteomics and formulation of proteins and peptides.

### **Instrumentation and Process control**

- Explain the concept of measuring, instruments for measuring and different application of measurements.
- Describe the methods for composition analysis, introduction to process control, types of controllers and the details of the same.
- Explain the concept of simple system analysis, frequency response and feedback control.

### **Chemical process Technology**

- Describe an industrial manufacturing process.
- Explain the type's unit operations.
- Explain the energy efficient and environment friendly process.
- Draw a plant lay out.
- Explain the different manufacturing process.

### **Food processing technology-IV**

- Describe the processing technology of different spices.
- Explain the processing and chemistry of major and minor spices
- Explain the different quality parameters of spices.

### **Pharmaceutical Analysis-III**

- Explain the concept of various techniques in the field of Pharmaceutical Analysis.



- Describe the concepts of analytical method for qualitative and quantification of the pharmaceutical substances.
- Explain instrumentation and interpretation of spectra used in pharmaceutical analysis.
- Describe the separation of vital active constituents by chromatographic techniques.
- Describe the concept of sophisticated instrumental techniques in advanced pharmaceutical research.

### **Bakery and confectionary technology**

- Develop an understanding of process technology of bakery and confectionery products
- Exhibit the use of sanitation and safety practices in bakery and confectionery Production in industry.
- Identify the right, machinery based on application
- To study the different Preservatives in bakery products with good knowledge in chemical property of preservatives

### **Photochemistry**

- Explain the concept of angiosperms, primary metabolites, and methods of extractions.
- Describe the glycosides, tannins, natural fibers and properties, pharmaceutical importance of the same.

### **Food safety and Quality**

- Develop Protocols based on GMP for Food Processing Industries
- Develop new innovative norms and Ensure implementation of adequate safety regulations and control.
- Demonstrate risk analysis based upon data and statistics obtained from production lines.

### **Physical Pharmacy**

- Describe the concept of Composition & Physical States of Matter, colligative properties, phase rule and solutions.
- Describe and implement the concepts of Micromeritics, Surface and Interfacial Phenomenon.
- Implement the Optimization of a process

- Explain the concept of Dispersion systems, Viscosity and Rheology.

### **Food Processing Technology-IV**

- Explain advanced treatment in the production, processing and acceptance of meat and poultry.
- Describe the process of developing products derived from meat and poultry.

### **Biopharmaceutics**

- Explain the concept of pharmacokinetic profile and factors affecting bioavailability.
- Describe the concepts of dissolution, distribution, elimination of drug and dosage regimen.
- Explain the concept of pharmacodynamics profile, Bioavailability and bioequivalence.
- Describe Plant design and project engineering
- Evaluate a project

### **Chemical Reaction Engineering**

- Classify chemical reaction.
- Design a batch and Continuous reactor.
- Prepare and select catalyst.
- Apply Residence time distribution.
- Describe the effect of temperature and pressure.

### **Food analysis**

- Explain the advanced methods of sampling of analysis and working of the analytical instruments.
- Demonstrate hands on experience in various sophisticated analytical instruments.
- Analyze various physicochemical, nutritional, microbial and sensory characteristics.

### **Phytopharmaceutical Technology**

- Explain the concept of herbal material and details of the same.
- Describe the concepts of volatile oils, alkaloidal phyto constituents and details of the same.

- Describe the concept of analysis of bioactive components of natural sources.
- Explain the concepts of standardization and contribution of natural products in modern drug discovery.
- Describe bulk drug industry like unit processes, equipments used and process optimization
- Explain the role of chemical technology involved in synthesis of drugs and intermediates. It broadly covers the purpose of chemical development, selection of the best route for scale-up, etc.
- Describe the operation of equipments used in bulk drugs manufacturing

### **Food Fermentation Technology**

- Explain various concepts, principles and procedures involved in the area of fermented food production
- Describe with different Fermentor types and their design criteria

### **Beverage Technology**

- Describe the process fermented alcoholic and non-alcoholic beverages
- Describe the process fruit juices and concentrates with process equipments
- Describe the process instant coffee powder adapting new technologies
- Use new technology to process tea
- Use brewing and fermentation for effective production of beverages

### **Drugs and intermediates**

- Explain the Unit Processes like nitration, oxidation, reduction, acylation, alkylation, esterification, halogenations and

### **Pharmaceutical Packaging Technology**

- Explain the various categories of packaging materials used in pharmaceutical industry.
- Choose proper packaging materials for different pharmaceutical dosage forms.
- Classify Packing material to be used in Pharma industry, their stability in terms of self life and quality assurance.
- Describe the legal and regulatory requirement with special emphasis on CGMP and CGLP

### **IPR & Drug Regulations**

- Describe the concept of legislation, consumer protection act, drug price control and drug-magic remedies act.
- Explain the concepts of Intellectual Property Rights, patent system and processing of the same.

- Explain the concept of patent and public interest, salient features of Indian Patents Act, Pharmaceutical patents in U. S. and brief information about the same

### **Industrial safety and Management**

- Explain the safety standards must be maintained in compliance with regulatory requirements and within engineering limits
- Describe the workplace injury prevention, risk management, and incident investigations.
- Explain the role of safety in the business community. Graduates will demonstrate knowledge of safety recordkeeping and management, and the role of the safety manager.
- Explain the acute and chronic health effects of exposures to chemical, physical and biological agents in the workplace.
- Explain the policies, procedures and equipment needed to deal with hazardous materials
- Demonstrate the Knowledge associated with Scope and functional areas, roles and levels, approaches of management & administration, purpose and steps of planning and Decision process.
- Demonstrate the Knowledge associated with Organizing, staffing, process of selection and recruitment, span of control, MBO & MBE Directing, steps in Coordination and Controlling

### **Applied Statistics**

- Appropriately choose, define and/or derive probability distributions such as the Binomial, Poisson and normal distribution to solve engineering problems.
- Formulate and test the hypotheses about means, proportions and standard deviation to draw conclusions based on the results of statistical tests in large sample.
- Formulate and test the hypotheses about means, variances for small samples using t and F test for small sample and have knowledge on ANOVA

- Describe the fundamentals of quality control and the methods used to control systems and processes

**Project work (Example of Food technology)**

- Develop new food products/equipments/improve the existence.
- Work individually and in a Team
- Apply knowledge of food process engineering to design or conduct research on food related processes/issues and to determine proficiency level of the subjects learnt in the entire course