CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN FOOD TECHNOLOGY

(Effective FROM 2020-21 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING, ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 5th Semester FOOD TECHNOLOGY (wef 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Entrepreneurship and Management & Smart Technology	4	-	-	20	80	3	100
Th.2		Food Process Engineering- 2	4	-	-	20	80	3	100
Th.3		Dairy technology	4	-	-	20	80	3	100
Th.4		Fish processing Engineering	4	-	-	20	80	3	100
Th.5		Instrumentation & Chemical Analysis *	4	-		20	80	3	100
		Total	20		-	100	400	-	500
		Practical							
Pr.1		Instrumentation Laboratory*	-	-	6	50	50	3	100
Pr.2		Food Engineering Laboratory 2	-	-	6	50	50	3	100
Pr.3		Project Phase-I	-	-	4	50	-	-	50
		Student Centred Activities(SCA)	-	-	3	-	-	-	-
		Total	-	-	*19*	*150*	-	-	-
		Grand Total	**20**	**0**	**19**	**250**	**500**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

Th1. ENTREPRENEURSHIP and MANAGEMENT & SMART TECHNOLOGY

(Common to All Branches)

Theory	**4 Periods per week**	**Internal Assessment**	**20 Marks**
Total Periods	**60 Periods**	**End Sem Exam**	**80 Marks**
Examination	**3hours**	**Total Marks**	**100Marks**

Topic Wise Distribution of Periods

Sl No.	Topic	Periods
1	Entrepreneurship	10
2	Market Survey and Opportunity Identification(Business Planning)	8
3	Project report Preparation	4
4	Management Principles	5
5	Functional Areas of Management	10
6	Leadership and Motivation	6
7	Work Culture, TQM & Safety	5
8	Legislation	6
9	Smart Technology	6
	TOTAL	60

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students, so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. It may be further added that an entrepreneurial mind set with managerial skill helps the student in the job market. The students can also be introduced with Startup and Smart Technology concept, which shall radically change the working environment in the coming days in the face of Industry 4.0

In this subject, the Students shall be introduced/ exposed to different concepts and Terminologies in brief only, so that he/she can have broad idea about different concepts/items taught in this subject. Solving numerical problem on any topic/item is beyond the scope of this subject.

OBJECTIVES

After undergoing this course, the students will be able to :

- Know about Entrepreneurship, Types of Industries and Startups
- Know about various schemes of assistance by entrepreneurial support agencies
- Conduct market survey
- Prepare project report
- know the management Principles and functional areas of management
- Inculcate leadership qualities to motivate self and others.
- Maintain and be a part of healthy work culture in an organisation.
- Use modern concepts like TQM
- Know the General Safety Rules
- Know about IOT and its Application in SMART Environment.

DETAILED CONTENTS

1. **Entrepreneurship**
   - Concept /Meaning of Entrepreneurship
   - Need of Entrepreneurship
   - Characteristics, Qualities and Types of entrepreneur, Functions
   - Barriers in entrepreneurship

- Entrepreneurs vrs. Manager
- Forms of Business Ownership: Sole proprietorship, partnership forms and others
- Types of Industries, Concept of Start-ups
- Entrepreneurial support agencies at National, State, District Level(Sources): DIC, NSIC,OSIC, SIDBI, NABARD, Commercial Banks, KVIC etc.
- Technology Business Incubators (TBI) and Science and Technology Entrepreneur Parks

2. **Market Survey and Opportunity Identification (Business Planning)**

- Business Planning
- SSI, Ancillary Units, Tiny Units, Service sector Units
- Time schedule Plan, Agencies to be contacted for Project Implementation
- Assessment of Demand and supply and Potential areas of Growth
- Identifying Business Opportunity
- Final Product selection

3. **Project report Preparation**

- Preliminary project report
- Detailed project report, Techno economic Feasibility
- Project Viability

4. **Management Principles**
- Definitions of management
- Principles of management
- Functions of management (planning, organising, staffing, directing and controlling etc.)
- Level of Management in an Organisation

5. **Functional Areas of Management**

a) Production management
- Functions, Activities
- Productivity
- Quality control
- Production Planning and control

b) Inventory Management
- Need for Inventory management
- Models/Techniques of Inventory management

c) Financial Management
- Functions of Financial management
- Management of Working capital
- Costing (only concept)
- Break even Analysis
- Brief idea about Accounting Terminologies: Book Keeping, Journal entry, Petty Cash book, P&L Accounts, Balance Sheets(only Concepts)

d) Marketing Management
- Concept of Marketing and Marketing Management
- Marketing Techniques (only concepts)
- Concept of 4P s (Price, Place, Product, Promotion)

e) Human Resource Management
- Functions of Personnel Management

- Manpower Planning, Recruitment, Sources of manpower, Selection process, Method of Testing, Methods of Training & Development, Payment of Wages

6. **Leadership and Motivation**

a) Leadership
- Definition and Need/Importance
- Qualities and functions of a leader
- Manager Vs Leader
- Style of Leadership (Autocratic, Democratic, Participative)

b) Motivation
- Definition and characteristics
- Importance of motivation
- Factors affecting motivation
- Theories of motivation (Maslow)
- Methods of Improving Motivation
- Importance of Communication in Business
- Types and Barriers of Communication

7. **Work Culture, TQM & Safety**

- Human relationship and Performance in Organization
- Relations with Peers, Superiors and Subordinates
- TQM concepts: Quality Policy, Quality Management, Quality system
- Accidents and Safety, Cause, preventive measures, General Safety Rules , Personal Protection Equipment(PPE)

8. **Legislation**

a) Intellectual Property Rights(IPR), Patents, Trademarks, Copyrights
b) Features of Factories Act 1948 with Amendment (only salient points)
c) Features of Payment of Wages Act 1936 (only salient points)

9. **Smart Technology**
- Concept of IOT, How IOT works
- Components of IOT, Characteristics of IOT, Categories of IOT
- Applications of IOT- Smart Cities, Smart Transportation, Smart Home, Smart Healthcare, Smart Industry, Smart Agriculture, Smart Energy Management etc.

Syllabus to be covered before IA: Chapter 1,2,3,4

RECOMMENDED BOOKS

1. Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
2. Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh
3. Entrepreneurship Development and Management by Vasant Desai, Himalaya Pub.House
4. Industrial Engineering and Management by O.P Khanna ,Dhanpat Rai and Sons
5. Industrial Engineering and Management by Banga and Sharma, Khanna Publications
6. Internet of Things by Jeeva Jose, Khanna Publications, New Delhi
7. Online Resource on Startups and other concepts
8. https://www.fundable.com/learn/resources/guides/startup

Th. 2 FOOD PROCESS ENGINEERING – II

Name of the Course: Diploma in Food Technology			
Course Code		Semester	5th
Total Periods	60	Examination	3 hours
Theory Periods:	4P/Week	Class Test Marks:	20
Tutorial	1P/ Week	End Semester Examination Marks	80
Maximum Marks:	100		

A. **Rationale**:

The food technologist who will work in a food processing plant must have the knowledge of the filtration, mixing, extraction, distillation, crystallization etc. The details of all these found in the syllabus so that they will not face any major problem while working as engineer.

Food process engineering is the Basic Subject of Food Technology. A Food Technologist should know that how an operation is taking place in food industry. Food process engineering tells us the mechanisms and principle of operation of different mechanical operation and separation operation using concentration gradient between different phases. All the basic operations in industries are based upon mass transfer.

B. OBJECTIVES:

After completion of Food process engineering the student will be able to

1. Understand the concepts of mass transfer operations like distillation, drying, extraction and crystallization separation.
2. Understand working principle of various mass transfer and mechanical equipment used in industry and its application.
3. Solve simple problems of mass transfer and mechanical operation

C.	**Topic Wise Distribution of Periods**	
SL. No.	Topics	Period
1	Size reduction & separation	10
2	Filtration & mixing	10
3	Extraction	10
4	Distillation & crystallization	10
5	Drying	05
6	Evaporation	10
7	Canning & Freezing	05
	Total	60

Content
1.0 Size reduction & separation 1.1 Objects of size reduction 1.2 Screening, Air filter, Air separation , membrane separation . 1.3 Study sedimentation equipments(froth flotation) 1.4 Study of classifiers, separators.

1.5 Study the equipments used for grading & sizing in food industry. 1.6 State and Explain Kick's law and Rittinger's law 1.7 Explain grinding(wet and dry)
2.0 Filtration & Mixing 2.1 Theory of filtration 2.2 Types of filtration 2.3 Different types of Filters used in industry 2.4 Object of mixing, Different types of mixers used in food industry(centrifuge, batch and continuous)
3.0 Extraction 3.1 Principles of extraction 3.2 Types of Extraction(solid-liquid extraction, liquid extraction) Study the types of equipments for extraction
4.0 Distillation &Crystallization 4.1Principles of Distillation, types of distillation(flash, steam and differential) 4.2Principles of Crystallization, types of Crystallization(batch, continuous)
5.0 Drying 5.1 Study the engineering aspects of Drying(Roller drier, spray drier, fluidised bed drier, freeze drier, solar dryer)
6.0 Evaporator 6.1Different types of evaporators used in food industries.
7.0 Canning & Freezing 7.1 Principles of canning, study of canning machine & other accessories used in canning industry. 7.2. Principles of freezing, study of different types of freezer(plate freezer, blast freezer, cryogenic freezer, vacuum freezer, refrigerator vans & wagons. 7.3 Study of different equipments used for processing of food.

Syllabus Coverage up to I.A

Chapter 1,2,3,4

E. Book Recommended			
Sr no	Name of Author	Title of Book	Name of Publisher
1	Treybal.	Mass transfer operation	Tata Mc Grawhill
2	Mc Cabe & J M Smith	Unit operation of Chemical Engineering	Tata Mc Grawhill
3	Badgero and Banchero	Introduction to Chemical Engineering	Tata Mc Grawhill
4	K Gavane	Unit operations I & II	Nirali Publication
5	Richardson & Coulson	Chemical Engineering Vol-2	Tata Mc Grawhill

Th. 3 DAIRY TECHNOLOGY

Theory:4 Periods per Week	Internal Assessment: 20 Marks
Total periods:60 Periods	Term End Examination: 80 Marks
Examination: 3 Hours	Total Marks: 100 Marks

A. **Rationale**:

Dairy technology is also known as the milk and milk products technology. Milk is the vital element, which contains a lot of vitamins. Some people do not like to drink milk but like milk products. The students of food technology after completion of study have the basic idea of milk and the production of milk products, to help those people who do not like milk. They also study the fermented milk products and infant milk food for the babies.

B. OBJECTIVES:

After completion of Dairy Technology the student will be able to

1. Understand the constituents and its importance in milk.
2. Describe the chemistry and technology involved and outlines of manufacturing of milk products which are of highly significant in daily life.

C. Topic Wise Distribution of Periods

SL. No.	Topics	Period
1	Introduction	04
2	Secretion	08
3	Constitution & Composition of milk	08
4	Processing, distribution & storage of liquid milk	15
5	Technology of Indigenous milk product	15
6	Fermented milk products	05
7	Production of infant milk food	05
	Total	**60**

Course Content
1.0 **Introduction** 1.1Objective and development of milk processing industries in India 1.1 Present status and future scope
2.0 Secretion 2.1 Theories of milk secretion 2.2 Function of hormones and their influence on milk secretion 2.3 Hygenic milk production
3.0 Constitution and composition of milk 3.1 Major and minor constituents of milk 3.2 Phisico-chemical properties of liquid milk 3.3 Factors effecting the composition of milk 3.4 Nutritive value milk and milk products 3.5 Microbiology of milk
4.0 Processing, distribution and storage of liquid milk

4.1 Processing of milk-Straining, filtration, clarification, cream separation 4.2 Heat treatment of milk- boiling, pasteurization, homogenization 4.3 Standardization of milk 4.4 Preparation of butter, ghee, condensed milk, evaporated milk, dried milk, ice-cream
5.0 Technology of indigenous milk products 5.1 khoa, rabri, kheer, lassie, pannier, channa, dahi,cheese
6.0 Fermented milk products 6.1 Preparation of different method of cheese(cheddar, cottage, processed Swiss, Roquefort, camembert) 6.2 Physical, chemical and microbiological changes 6.3 Fortification of milk products
7.0 Production of infant milk food

Syllabus Coverage up to I.A

Chapter 1,2,3,4

E. Book Recommended			
Sr no	Name of Author	Title of Book	Name of Publisher
1	Eckles, Combs	Milk & Milk Products	THM
2	DE	Out lines of Dairy Tech	Oxford
	Atherton & Newlander	Chemistry & testing of diary products	CBS

Th. 4 FISH PROCESSING TECHNOLOGY

Theory:4 Periods per Week	Internal Assessment: 20 Marks
Total periods:60 Periods	Term End Examination: 80 Marks
Examination: 3 Hours	Total Marks: 100 Marks

A. Rationale:

India has vast potential for fisheries in view of our long coastline spanning about 8,118 kms in addition to inland water resources. India is the second largest producer of fish and also second largest producer of fresh water fish in the world. The sector plays an important role in the overall socio-economic development of India. The sector has gained importance as it contributes significantly to the national food security, livelihood generation, agriculture diversification and enhanced foreign exchange earnings. Almost 50 per cent of inland fish production is from culture fisheries, which constitutes 6.5 per cent of global fish production**.** As a result, starting from a purely traditional activity in the early fifties, fisheries and aquaculture have now transformed into a significant commercial enterprise. As per the Indian Livestock Census, 2003, 14.5 million people were engaged in various fisheries related activities. About 75% of the fishers are engaged in inland fisheries activities and about 25% in marine fisheries activities.

B. OBJECTIVES:

After completion of study of Fish Processing Technology, the student will be able to

1. Understand the quality of fish and its preservation methods.
2. Understand the manufacturing process of different fish products.

C. Topic Wise Distribution of Periods

Sl. No.	Topics	Period
1	Introduction	15
2	Quality of Fresh Fish	15
3	Spoilage and preservation	15
4	Fish products	15
	Total	60

Course Content
1.0 Introduction 1.1. Study the development of fisheries in India. 1.2 Structure of fish 1.3 Fish quality 1.4 Fish processing 1.5 Composition & Nutritive value
2.0 **Quality of fresh fish** : 2.1 Factors affecting quality. 2.2 Criteria to access quality. 2.3 Bio-chemical changes in fish after catching.
3.0 **Spoilage & Preservation** : 3.1 Contamination & spoilage in general 3.2 Method of preservation of fish by different method.

4.0 **Fish Products**: 4.1 Manufacture of fish protein, concentrates, fish sauces, and fish sausage. 4.2. Quality aspects of processed fish

Syllabus Coverage up to I.A

Chapter 1,2,3

E. Book Recommended			
Sr no	Name of Author	Title of Book	Name of Publisher
1	Dr Sunita Rai	Fish Processing Technology	Random publication
2	Naveen Gupta	Fish Processing Technology	Oxford Book Company
3	K D Bharadwaj	Modern Techniques in fish handling and processing	Cyber Tech Publication

Th-5 Instrumentation & Chemical Analysis

(Common to Chemical Engineering, Biotechnology & Food Technology)

Theory:4 Periods per Week	Internal Assessment: 20 Marks
Total periods:60 Periods	Term End Examination: 80 Marks
Examination: 3 Hours	Total Marks: 100 Marks

A. Rationale:

Number of control equipment and measuring devices are used in the operation of chemical engineering unit operation equipment to control of process variable, these variables like temperature, pressure, level, viscosity, density, refractive index etc. affect the processing equipment and ultimately affect the product quality. It is necessary to study the principle of operation of process variables measuring devices, so that they may be used either on-line or off line for this purpose.

B. **Objectives :**

After completion of study of Instrumentation and Process Control the student will be able to :

1. Understand working principle, construction, repair and maintenance of measuring instrument and their used to control chemical engineering unit operations and processes.
2. Operate modern analytical instruments for measuring process parameters

TOPIC WISE DISTRIBUTION OF PERIODS

SL. No.	Topic	Periods
1	Instrument	05
2	Measurement	10
3	pH measurement	05
4	Temperature measurement	10
5	Pressure measurement	10
6	Automatic control	20
	Total	**60**

Chapter 1.0 INSTRUMENT

1.1 Instruments and its importance
1.2 Standards of measurement
1.3 Functional elements of instruments
1.4 Performance characteristics of an instrument

Chapter 2.0 MEASUREMENTS OF CHARACTERISTICS

2.1 Measurement of viscosity by Red Wood Viscometer, Falling Sphere Viscometer, Continuous Viscometer
2.2 Principle and uses of spectrophotometer
2.3 Principle and uses of polarimeter
2.4 Measurement of refractive index by Refractometer

Chapter 3.0 pH & CONDUCTIVITY MEASUREMENT

3.1 Measurement of pH
3.2 Measurement of electrical conductivity

Chapter 4.0 TEMPERATURE MEASURMENT

4.1 Different temperature scales.
4.2 Different methods of temperature measurement.
4.3 Temperature measurement by liquid in glass thermometer
4.4 Describe temperature measurement on electrical phenomena – like thermocouple, resistance thermometer, optical pyrometer, radiation pyrometer.

Chapter 5.0 PRESSURE MEASUREMENT

5.1 Different types of pressure
5.2 Different methods of measurement of pressure.
5.3 Pressure measurement by Bourdon tube, Bellows
5.4 Maintenance and repair of pressure measuring instruments.

Chapter 6.0 AUTOMATIC CONTROL

6.1 Automatic control system and explain the application with example.
6.2 Elementary idea about transfer functions for a first order system and time constant.
6.3 Block diagram and components of Process Control system
6.4 Types of process control system, advantages and disadvantages
6.3 Elementary idea about different types of automatic controllers.
6.4 Principle of PLC, computer Aided measurement and control

Syllabus Coverage up to I.A
Chapter 1,2,3,4

E. Book Recommended			
Sr no	Name of Author	Title of Book	Name of Publisher
1	D.P. Eckman	Industrial Instrumentation	CBS Publication
2	S.K. Singh	Industrial Instrumentation and control	Tata Mc Grawhill
3	A.K. Srivastava	Instrumental Approach to Chemical Analysis	S Chand

Pr-1 INSTRUMENTATION LABORATORY

(Common to Chemical, Biotechnology & Food Technology)

Practical:6 Periods per Week	Sessional: 50 marks
Total periods:90Periods	Practical Examination: 50 marks
Examination: 3 Hours	Total Marks: 100 Marks

A. Rationale:

An instrument is a device that measures or manipulates process physical variables such as flow, temperature, level, or pressure etc. Instrumentation is the basic process control in industry. In industrial control a wide number of variables temperature, flow, level, pressure, and distance can be sensed simultaneously. Structure of Industrial Instrumentation in Real Time Applications includes for measuring, regulating physical quantities such as flow, level, pressure, temperature and so on. Output instrumentation includes control devices such as valves, regulators, circuit breakers and relays.

Students will gain skill to handle, measure and care of different instruments used in the process industry.

B. **Objectives :**

After completion of study of Instrumentation and Process Control the student will be able to :

1. Understand working principle, construction, repair and maintenance of pH Meter, Polari meter, Refracto meter, Viscometer used in industry
2. Understand the principle of measuring instruments.

List of EXPERIMENTs

SL. No.	Experiment
1	Separation of Iron using solvent extraction technique
2	Determine pH and conductivity of a given solution by pH-meter
3	Determine the concentration of sugar in sugar solution by Polarimeter
4	Determine the refractive index of different liquids by Abbe's Refractometer
5	To determine a) Maximum wavelength of a solution of cobalt chloride b) Verify Beer's Law and apply it to find the concentration of the given unknown solution by Spectrophotometer
6	To verify Beer's law of solution of $KMnO_4$ and $K_2Cr_2O_7$ using calorimeter
7	Demonstrate different types of pressure gauges and temperature measuring devices
8	Determine the viscosity of an Oil by Red Wood Viscometer at different temperature and plotting a graph between viscosity and temperature
9	Calibration of a thermocouple
10	Demonstrate function of digital multi-meter

Pr-2 FOOD PROCESS ENGINEERING-2 LABORATORY

Practical:6 Periods per Week	Sessional: 50 marks
Total periods:90 Periods	Practical Examination: 50 marks
Examination: 3 Hours	Total Marks: 100 Marks

A. Rationale:

Food Processing Engineering is one of the basic tenets of Food Technology and contains many practical concepts that are utilized in industrial applications.. Students will learn the principle of Food Processing operation through practically using Laboratory equipments used in the process industry.

B. **Objectives :**

After completion of Practical of Food Processing operation, the student will be able to :

1. Understand working, construction and operation of Cyclone Separator, Driers, Crystallisers,canning machine used in industry
2. Understand the principle of preservation techniques used in the Food industry

List of Experiment

Sr No	Content
1	Study and operation of a mechanically/manually operated sieve-shaker; Particle size measurement by screen analysis of a ground product
2	Study and operation of a cyclone separator
3	Study and operation of a tray dryer; determination of drying rate under constant drying condition and plotting graph of falling rate period
4	Study and operation of different types of canning machines.
5	Study and operation of a refrigerator deep freezer
6	Study and operation of a plate and frame filter press; determination of rate of filtration under different pressures
7	Study and operation of a centrifuge
8	Study and operation of different types of food processing equipments used in food industry.
09	Study and operation of crystallizer
10	Study and operation of a humidifier; determination of humidity by dry and wet bulb thermometer from psychometric chart
11	Physical Examination of milk and sampling
12	Analysis of milk for water, fat, solids, acidity, specific gravity, freezing point, viscosity and electrical conductivity (a) Methylene blue reductase test (b) Gerber's fat test (c) Solid non-fat test
13	Pasteurization of milk
14	Homogenization of milk
15	Production of following milk products (a) Condensed milk

	(b) Evaporated milk (c) Dried milk (d) Cream (e) Butter (f) Ghee (g) Ice-cream (h) Flavored and chocolate milk
16	Preparation of indigenous milk products

Pr 3. PROJECT WORK (Phase-I)

Name of the Course: Diploma in Food Tech.			
Course code:		Semester	5th
Total Period:	60	Examination :	-
Theory periods:	4P / week	Sessional Marks	50
		TOTAL Marks	50

RATIONALE

Students' Project Work aims at developing innovative skills in the students whereby they apply the knowledge and skills gained through the course covered in many subjects and Labs, by undertaking a project. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of Food Technology and practices in real life situations, so as to participate and manage a Food Tech. Project in future.

Entire Project shall spread over 5th and 6th Semester. Part of the Project covered in 5th Semester shall be named as *Project Phase-I* and balance portion to be covered in 6th Semester shall be named as *Project Phase-II*.

OBJECTIVES

After undergoing the Project Work, the student will be able to:

- Implement the theoretical and practical knowledge and skills gained through various subjects/courses into an application suitable for a real practical working environment, preferably in an industrial environment.
- Develop software packages or applications and implement these for the actual needs of the community/industry.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key areas, asynchronous document sharing and discussions, as well as prepare collaborative edition of the final project report.
- To achieve real life experience in software/hardware design.
- To develop the skill of writing Project Report

General Guidelines

The individual students have different aptitudes and strengths and also areas of interest. Project work, therefore, should match the strengths and interest of the students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (right from beginning of 5th semester). Students should be allotted a problem of interest to him/her as a project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual

assignment or a group assignment. Preferably there should not be more than 5 students, if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

Following are the broad suggestive areas of project work

- ✓ Processes based Project: Manufacture of product.
- ✓ Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
- ✓ Experimental based Project: Experimental investigation of basic or applied research problem.
- ✓ Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation under the guidance of a staff member and /or staff members and submit a typed report in duplicate.
- ✓ Research Oriented: Any application/renovation/modification of a latest technology

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

Sl. No.	**Performance Criteria**
1.	Selection of project assignment
2.	Planning and execution of considerations
3.	Quality of performance
4.	Providing solution of the problems or production of final product
5.	Sense of responsibility
6.	Self expression/ communication/ Presentation skills
7.	Interpersonal skills/human relations
8.	Report writing skills
9	Viva voce

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations to such an exhibition.

Project Phase-I and Phase-II

The Project work duration shall cover 2 semesters(5^{th} and 6^{th} sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5^{th} sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work including Design of the system have to be complete in Phase-I. Project Milestones are to be set so that progress can be tracked . In Phase-II Work execution, Simulation, Testing, Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-I in 5^{th} semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

Equipment List

INSTRUMENTATION LABORATORY		
Sr	Name of equipment with specification	Quantity per student strength up to 60
1	Conical flask-100ml, 250ml,500 ml	02
2	Volumetric flask-100ml, 250ml	02 no each
3	Burrete-50 ml with complete fitting	02 no each
4	Reagent bottle-250ml	05 no
5	Funnel- different size	02 no
6	Tripod stand	02 no
7	Mortar and pestle	01 no
8	Beaker-250 ml and 500 ml	05 no
9	Pipette- 10 ml, 25 ml	05 no
10	Measuring cylinder-10 ml,50 ml,100 ml	01each
11	Provision of LPG gas heating facility	02 no
12	Separating funnel-500 ml	02 no
13	Digital pH meter	01 no
14	Polarimeter	01 no
15	Refractometer	01 no
16	Laboratory model spectrophotometer	01 no
17	Calorimeter	01 no
18	Different types of pressure gauges, temperature gauge	01 no
19	All small glass ware like glass rod, spatula, watch glass, test tube, test tube holder, dropping bottle etc as per experiment requirement	As per need
20	Digital multimeter	01 no
21	Thermocouple calibration set up	01 no
FOOD PROCESSING LABORATORY-2		
Sr	Name of equipment with specification	Quantity per student strength up to 60
1	Fruit Mill / Crusher	01 no
2	Automatic Steam Boiler – Horizontal model	01 no
3	Steam Jacketed Kettle	01 no
4	Emulsifier	01 no
5	Weighing Scale	01 no
6	Stainless Steel collection vessel	01 no
7	Mixing Tank	01 no
8	Plate and Frame Filter Press-Laboratory model	01 no
9	Homogenizer (Double stage)	02 no
10	Pulp Pasteurizer	01each
11	Vacuum Filling Machine	02 no
12	Super Crown Corking Machine	02 no
13	Twist off Lug Cap Sealing Machine	02 no each
14	Auomatic Bottle Line	01 no
15	Automatic Form Fill Seal machine, Mechanical Cup Filler, Vertical type.	01 no

16	Cyclone Separator	01 no
17	Deep Freezer	01 no
18	Centrifuge for food processing	01 no
19	Open Pan Crystalliser	01 no
20	Tray Drier	01 no
21	Screens of separate size	01 no
22	Sieve Shaker	01 no