

**Scheme of Teaching and Examination for  
6th Semester of 3 Years Diploma in Food Technology**

Duration of Semester : **14 Weeks**  
 Student Contact Hours : **36 Hrs**  
 Total Marks : **800**  
 Effective from : 2017 -18 Session

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Industrial Engineering & Management	601	Theory	3		-	3	100	80	20	26	40
2.	Automation in Food Processing	FTC 604	Theory	3	-	-	3	100	80	20	26	40
3.	Instrumentation & Process Control	FTC 605	Theory	3	-	-	3	100	80	20	26	40
4.	Food Analysis, Quality Control & Packaging Technology	FTC 606	Theory	3	-	-	3	100	80	20	26	40
5.	Elective II	FTC 607/608/609	Theory	3	-	-	3	100	80	20	26	40
6.	Automation in Food Processing Lab	FTC 610	Sessional	-	-	2	-	50	30	20	-	25
7.	Instrumentation & Process Control Lab	FTC 611	Sessional	-	-	2	-	50	30	20	-	25
8.	Food Analysis, Quality Control & Packaging Technology Lab	FTC 612	Sessional	-	-	2	-	50	30	20	-	25
9.	Elective II Lab	FTC 613/614/615	Sessional	-	-	2	-	50	30	20	-	25
10	Project Work	603	Sessional	-	-	4	-	50	30	20	-	25
11	Professional Practices	602	Sessional	-	-	4	-	50	30	20	-	25
<b>Total Hours of Teaching per week :</b>				<b>15</b>		<b>16</b>						

Elective III (Waste Management in Food Industry- FTC 607/ Food Laws Standards & Regulations-FTC608 /Advance in Food Processing Technology- FTC609)

Total Marks: Theory : Practical : Sessional :  
 L : Lecture, T : Tutorial P : Practical

- Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.  
 2. Remaining Hrs every week has been marked for students for Library and Student Centred Activities.  
 3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.  
 4. Board will depute examiner for Practical examination.  
 5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the Sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

**Subject : Industrial Engineering & Management (Common Paper)**

**Subject Code : 601**

**Full Marks : 80+20= 100**

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>0</b>	<b>0</b>

**Rationale:**

After completion of three years of technical training, Polytechnic students are expected to enter in to the World of Work. The business environment is altogether different and new to the students. A proper introduction and understanding of Business Processes is therefore essential for all Polytechnic students. Management is a subject which deals with basics of Management science required to understand the processes the in Industrial & Commercial environment. This will enable the students of Polytechnic to become familiar and to understand various Business Organizational structures, their functioning and the Role these technicians will have to play in these setups with responsibilities.

Industrial Engineering is concerned with the design, improvement and installation of integrated systems of people, materials, equipment and energy. Polytechnic students must be able to analyze the use and cost of the resources of the organization in order to achieve the objective, i.e. to increase productivity, profits etc. and carryout the policies efficiently and effectively.

**Objective:**

The students will able to:

1. Familiarize environment in the world of work.
2. Explain the importance of management process in Business.
3. Identify various components of management.
4. Describe Role & Responsibilities of a Technician in an Organizational Structure.
5. Apply various rules and regulations concerned with Business & Social responsibilities of the technician.

## Detailed Syllabus

1. **Productivity :** **02 Hrs**  
Production and productivity, importance of productivity, factors affecting productivity, means of increasing productivity.
2. **Plant Layout and Material Handling :** **02 Hrs**  
Definition of plant layout, objectives of good plant layout, principles of plant layout, types of plant layout, flow pattern, steps in planning the layout for a new enterprise, definition of material handling, functions and principles of material handling, material handling devices.
3. **Work Study :** **04 Hrs**  
Definition, concept and need for work study, objectives of method study and work measurement, basic procedure/steps in method study, recording technique, critical examination, principles of motion economy, stop watch procedure for collecting time study data, including performance rating and allowances, work sampling.
4. **Production Planning and Control (PPC) :** **04 Hrs**  
Definition and objectives of PPC, functions of PPC, routing, scheduling, loading, dispatching, production control definition and objectives, principle of sound production control system.
5. **Material, Purchase and Stores Management :** **04 Hrs**  
Definition, functions& objectives of materials management, inventory control, economic order quantity (EOQ), ABC analysis. Objectives of purchasing department, buying techniques, purchasing procedure (steps involved in one complete purchasing cycle); functions of stores department, location and layout of stores, receipt and issue of materials.
6. **Quality Control and TQM :** **04 Hrs**  
Meaning of quality and quality control, dimensions of quality, quality circle, concept and definition of TQM, elements of TQM, Kaizen, 5 'S' and six sigma.
7. **Management :** **04 Hrs**  
Various definition, concept of management, levels of management, administration and management, scientific management by F. W. Taylor. Principles of management (14 principles of Henry Fayol). Functions of management - planning, organizing, coordinating, directing, controlling, decision making.
8. **Organizational Management :** **04 Hrs**

Organization - definition, steps in forming organization. Types of organization. Types of organization - line, line and staff, functions, project type. Departmentation- Organized and decentralized, authority and responsibility, span of control (management). Forms of ownership - proprietorship, partnership, joint stock company, co-operative society, govt. sector.

9. **Human Resource Management :**

**06 Hrs**

Personnel Management – Introduction, definition, function. Staffing – Introduction to HR, Introduction to HR Planning, Recruitment procedure. Personnel- Training & Development – Types of training, Induction, Skill enhancement. Leadership & Motivation – Leadership- Styles & types, Motivation- Definition, Intrinsic, &Extrinsic, Maslow’s theory of Motivation and its significance. Safety Management – Causes of accident, Safety Procedures. Introduction, Objectives & feature of Industrial Legislation such as – Factory act, ESI act, Workman compensation act, Industrial dispute act and salary & wages.

10. **Financial Management :**

**04 Hrs**

Financial Management- Objectives & Functions. Capital Generation & Management- Types of capitals, Sources of finance. Budgets and accounts- Types of budgets, Production budget (including variance report), Labour budget, Introduction to Profit & Loss Accounts (Only concept), Balance sheet etc.

11. **Entrepreneurship :**

**04 Hrs**

Concept and definition of entrepreneur and entrepreneurship, factors influencing entrepreneurship, entrepreneurial characteristics, need for promotion of entrepreneurship and small scale industries, steps in setting up a small scale industrial enterprise.

**References Books :**

1. Industrial Engineering and Management by O. P. Khanna
2. Industrial Engineering and Production Management by M. Mahajan.  
Publisher :Dhanpat Rai Publication (P) Ltd. New Delhi
3. Business Administration and Management by Dr. S. C. Saksena  
Publisher :Sahitya Bhawan, Agra.

**Subject** : Automation in Food Processing  
**Subject Code** : FTC604  
**Full Marks** : 80+20=100  
**Hours** : 42

1. Measurement system and error analysis, measurement of level, flow, temperature, strain pressure, vacuum, force, torque, power, displacement, vibration, acceleration, pH, colour viscosity, surface tension and composition. Indicating recording instruments, digital displays, transmitting and telemetering devices. (06 Hrs)
2. Introduction to control system- Feedback and feed forward control strategies, block diagrams, Mode of control and generation of control action; P. PI and PID control elements and value positioners, Electronic, pneumatic and hydraulic control systems and their application in farm machinery, food processing industry, aquaculture and their applications milk processing plants. (06Hrs)
3. Introduction: electronic nose, food quality evaluation, indication variables, Data acquisition, elastography, electronic nose, ultrasonic, Data analysis, intramuscular fat, wavelet, marbled meat, statistical textural feature extraction from, elastography, Sampling, concept and system for data acquisition, image acquisition, ultrasonic B- mode imaging. Data Analysis – Data processing, Dynamic data analysis, Image processing. (08 Hrs)
4. Modeling system identification, Modeling strategy, linear statistical modeling, ANN Modeling, (04 Hrs)
5. F statistic, null hypothesis Prediction Levenberg-Marquardt algorithm, recurrent neural networks, gradient descent. Control objective function, neuro-fuzzy, membership functions Systems integration assembly language, high-level programming language. (06 Hrs)
6. System integration, Robotics, Application of robotics and basic components of robotics, Features of II and II generation robots. (04 Hrs)
7. Bottle Washing Machine Automaton, Bottling Plant Drive System, Demineralization Plant Control System, Labeling Machine Control system, Charger level automation, Reverse Osmosis plant automation, Thermal plant automation, Dehydration and freezing pant automation. Automation in different units of food processing, preparation of raw food and materials, sorting, grading, size reduction, mixing an agitation, thermal processing, dehydration, packaging, CIP, quality control. (08 Hrs)

**Books:**

1. Considine 2001. *Process Control*. AVI Publ.
2. Huang Y & Lacey RE. 2003. *Principles of Robotics*. CRC Press.
3. Huang Y, Whittaker AD & Lacey RE. 2001. *Automation for FoodEngineering*. CRC Press.

**Subject** : Instrumentation & Process Control  
**Subject Code** : FTC 605  
**Full Marks** : 80+20=100  
**Hours** : 42

## **RATIONALE**

After studying the course the students will be able to identify different types of sensors and transducers and their applications in the field of instrumentation and process control used in food industry. The students will be able to select appropriate transducers relating to a process and will also get the relevant technical know how about the conditioning of a signal from a transducer for the purpose of control. This course will also enable the students to study in detail different types of control systems used in instrumentation and will provide understanding of basic control loops

The objective of this course is to give the knowledge of various instruments and skill in handling them, which control the process parameters and various operations in any food industry

## **DETAILED CONTENTS**

1. Introduction (04 hrs)  
Importance of instruments in process industries. Classification of instruments, static and dynamic characteristics of instrument.
2. Instruments for Temperature Measurement (06 hrs)  
Thermometer, thermocouple, thermister and pyrometer, application and working.
3. Instruments for pressure Measurement (06 hrs)  
Use of Manometers, Bourdon gauge, measurement of vacuum and pressure.  
Liquid level measurement-Direct and differential method.
4. Flow Measurements (08 hrs)  
Flow measurement and calibration with orifice, venturi meter, rotameter, pitot tube

5. Instruments for Miscellaneous Measurements (08 hrs)

Measurement of viscosity, conductivity, humidity and pH value, TSS, industrial weighing systems.

6. Controls (08 hrs)

Concept of automatic process control and its classifications. Types of controllers and their applications.

**Subject : Instrumentation & Process Control**

**Subject Code : FTC 611**

### **List of practical**

1. Measurement of basic quantities using static and dynamic instruments.
2. Measurement of temperature thermocouple and pyrometer.
3. Measurement of pressure using Bourdon gauge.
4. Measurement of liquid level through differential method.
5. Measurement of flow through venture meter.
6. Calibration of rotameter.
7. Determination of relative humidity using wet and dry bulb temperature method.
8. Measurement of viscosity by drop method.
9. Measurement of pH value.
10. Study of controllers.

### **RECOMMENDED BOOKS**

1. Process Control by Harriott and Peter Process system Analysis and Control of Coughanour; McGraw Hill
2. Industrial Instrumentation by Eckman; Wiley Eastern

**Subject** : Food Analysis, Quality Control & Packaging Technology  
**Subject Code** : FTC606  
**Full Marks** : 80+20=100  
**Hours** : 42

## **RATIONALE**

In the production of processed foods, one of the important aspects is to assure quality. This subject is introduced in the curriculum to impart knowledge and skills in the students related to various food quality parameters/systems, techniques of food analysis, food laws and standards

## **DETAILED CONTENTS**

1. Introduction (06 hrs)

1.1. Principle behind different methods of proximate analysis of

- 1.1.1. Moisture
- 1.1.2. Ash
- 1.1.3. Crude Fat
- 1.1.4. Crude Protein
- 1.1.5. Crude Fibre
- 1.1.6. Total Carbohydrates

1.2. Concept, objectives and need of

- 1.2.1. quality,
- 1.2.2. quality control and
- 1.2.3. quality assurance
- 1.2.4. TQM (Total Quality Management) and
- 1.2.5. TQC (Total Quality Control),



1.2.6. plan and methods of quality control

2. Sampling (02 hrs)

- 2.1. Definition of sampling,
- 2.2. purpose,
- 2.3. sampling techniques requirements and
- 2.4. sampling procedures for
  - 2.4.1. liquid,
  - 2.4.2. powdered and
  - 2.4.3. granular materials

3. Food Laws and Regulations in India (06 hrs)

Agencies and standards :

- BIS (Bureau of Indian Standards),
- AGMARK (Agricultural Marketing Board),
- PFA (Prevention of Food Adulteration Act),
- FSSA (Food Safety and Standards Act),
- FPO (Fruit Products Order),
- MoFPI (Ministry of Food Processing Industries)
  
- ISO (International Organisation for Standardisation)- Objectives and principles
  
- CAC (Codex Alimentarius Commission)

4. General Hygiene and Sanitation in food industry (06 hrs)

Concepts of:

- 4.1. GMP (Good Manufacturing Practices),
- 4.2. GHP (Good Hygienic Practices),
- 4.3. GLP (Good Laboratory Practices)
- 4.4. HACCP (Hazard analysis and critical control point)

5. Quality control by hyperspectral imaging technique. (04 Hrs)

6. Layout of quality evaluation and control laboratories (02hrs)

7. Packaging Materials and Types of Packaging, Vacuum, gas, MAP, CAP, active, Aseptic,

- edible and shrink packaging. (06 Hrs)
8. Introduction to WVTR, GTR, bursting strength, tensile strength, tearing strength, drop test, puncture test, impact test. (04 Hrs)
9. Packaging Requirements for Meat, fish, poultry, eggs, milk and dairy products, Fruits and vegetables, cereal grains and baked food products, Beverages and Snacks (04 Hrs)
10. Packaging Machinery for Bottling, can former, form fill and seal machines, bags – their manufacturing and closing, vacuum packs unit, shrink pack unit, tetra pack unit (06 Hrs)

**Subject : Food Analysis, Quality Control & Packaging Technology Lab**  
**Subject Code : FTC612**

### **LIST OF PRACTICALS**

1. Detection of basic tastes and their threshold values
2. Consumer acceptability trial
3. Statistical analysis of sensory data
4. Visits to the quality control laboratories of the food industry, educational institutions and testing centres
5. Analysis of quality of fish Meat, Eggs using hyperspectral imaging instrument.
6. Detection of adulterations with different grains in wheat products. Using hyperspectral method.
7. Detection of adulterations with in Dal (Pulses) with toxic seeds using hyperspectral techniques.
8. Detection of ripening and artificial ripening of fruits using hyperspectral techniques.
9. Identification of different types of packaging and packaging materials
10. Determination of tensile strength of given material
11. To perform different destructive tests for glass containers
12. To perform non-destructive tests for glass containers such as physical examination
13. Measurement of thickness of packaging materials
14. To perform grease-resistance test in plastic pouches
15. Determination of water-vapour transmission rate for paper
16. Demonstration of can-seaming operation
17. Testing of chemical resistance of packaging materials
18. Determination of drop test of food package
19. Visit to relevant industries
20. Introducing the students with the latest trends in packaging consulting the web sites and magazines

## RECOMMENDED BOOKS

1. Food Analysis by Suzzane Nielsen
2. ISI Handbook of Food Analysis- (18 Volumes in 5 parts)- BIS
3. AOAC- 18<sup>th</sup> Edition- (CD ROM Edition)
4. Hand Book of Analysis of Fruits and Vegetables by S Ranganna (THM)
5. Food Analysis Theory and Practices by Pomeranz and Meloan (AVI)
6. Quality Control for the Food Industry (Vol. I and II) by Kramer and Twigg (AVI)
7. Laboratory Methods of Sensory Evaluation by Larmond
8. Sensory Analysis by Piggot
9. Hand Book of Food Analysis by S.N. Mahindru
10. The Chemical Analysis of Food and Food Products by Jacobs
11. A First Course in Food Analysis by A.K. Sathe
12. Handbook of Packaging by Paine and Paine; Morgan-Grampian *Publishing Co.*, New York (1976).
13. Manual of Analyzing for Fruits and Vegetables Products by S Ranganna; CBS *Publishers & Disttributor*, New Delhi.

**Subject : Waste Management in Food Technology**  
**Subject : FTC607**  
**Full Marks : 80+20=100**  
**Hours : 42**

## **RATIONALE**

This subject is aimed at developing an understanding among the students on Management of agro-processing waste, by-product utilization as food/feed and environmental protection.

## **DETAILED CONTENTS**

1. Introduction (04 hrs)

Types of waste and magnitude of waste generation in different food processing industries; concept scope and maintenance of waste management and effluent treatment

2. Waste Characterization (08 hrs)

Temperature, pH, Oxygen demands (BOD, COD, TOD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues

3. Environmental protection act and specifications for effluent of different food Industries (06 hrs)

4. By-products and Waste utilization (08 hrs)

5. Effluent Treatment (10 hrs)

5.1 Pre-treatment of waste: sedimentation, coagulation, flocculation and Floatation

5.2 Secondary treatments: Biological oxidation – trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons

- 5.3 Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters, phosphorous, sulphur, nitrogen and heavy metals removal
6. Assessment, treatment and disposal of solid waste; concept of vermin-composting and biogas generation (06 hrs)

**Subject : Waste Management in Food Technology**  
**Subject : FTC613**

### **LIST OF PRACTICALS**

3. Waste characterization temperature and pH.
4. Waste characterization solids content and turbidity
5. Waste characterization BOD and COD
6. Biogas production using food waste.
7. Visit to effluent treatment plant attached with food industry and city
8. To estimate residual chlorine
9. Evaluation effect of lime treatment on waste water in respects of BOD, COD, solids content, phosphate content
10. Visits to various industries using waste and food by-products
11. Visit to Biogas plant and vermin-culture centre
12. Compost formation from food waste.

### **RECOMMENDED BOOKS**

1. Food Processing Work Management by Green and Krammer; CBS Publication
2. Principles of Food Sanitation by Mariett NG; CBS Publication

**Subject : Food Laws Standards & Regulations**

**Subject Code : FTC608**

**Full Marks : 80+20=100**

**Hours : 42**

1. Introduction, concept of food safety and standards, food safety strategies. Food hazards and contaminations - biological (bacteria, viruses and parasites), chemical (toxic constituents / hazardous materials) pesticides residues / environmental pollution /chemicals) and physical factors. Preventive food safety systems -monitoring of safety, wholesomeness and nutritional quality of food. (06 Hrs)
2. Prevention and control of microbiological and chemical hazards. Food safety aspects of novel methods of food processing such as PEF, high pressure processing, thermal and non thermal processing, irradiation of foods. (06 Hrs)
3. Indian and Food Regulatory Regime (Existing and new), PFA Act and Rules, Food Safety and Quality Requirements, Additives, Contaminants and Pesticide Residue. Food Safety and Standards Act, 2006, Essential Commodities Act, 1955, Global Scenario, Codex Alimentarius, WHO/FAO Expert Bodies (JECFA/JEMRA/JMPR) WHO/FAO Expert Bodies (JECFA/ JEMRA/JMPR).Food safety inspection services (FSIS) and their utilization. (08 Hrs)
4. Introduction to OIE & IPPC, Other International Food Standards (e.g. European Commission, USFDA etc). WTO: Introduction to WTO Agreements: SPS and TBT Agreement, Export & Import Laws and Regulations, Export (Quality Control and Inspection) Act, 1963. (06 Hrs)
5. Customs Act and Import Control Regulations, Other Voluntary and mandatory product specific regulations, Other Voluntary National Food Standards: BIS Other product specific standards; AGMARK. Nutritional Labeling, Health claims. (06 Hrs)
6. Risk assessment studies: Risk management, risk characterization and communication. (04 Hrs)
7. Voluntary Quality Standards and Certification GMP, GHP, HACCP, GAP, Good Animal Husbandry Practices, Good Aquaculture Practices ISO 9000, ISO 22000, ISO 14000, ISO 17025, PAS 22000, FSSC 22000, BRC, BRCIOP, IFS, SQF 1000, SQF 2000. Role of NABL, CFLS. (06 Hrs)

**Subject : Food Laws Standards & Regulations Lab**  
**Subject Code : FTC614**

**List of Practical:**

1. A case preparation for reporting of adulteration in food industry.
2. To attend a food adulteration in consumer forum proceeding.
3. A literature survey for trends in Standards of food safety
4. Case study under any law related to food.
5. WTO and Indian regulation comparison

**Books:**

1. Singal RS (1997). Handbook of indices of food quality and authenticity. Woodhead Publ. Cambridge, UK.
2. Shapton DA (1994). Principles and practices of safe processing of foods. Butterworth Publication, London. Winton AL (1999) Techniques of food analysis, Allied Science Publications NewDelhi.
3. Pomeranze Y (2004). Food analysis - Theory and Practice CBS Publications, New Delhi.
4. Jacob MB (1999). The chemical analysis of foods and food products. CBS Publ. New Delhi

**Subject : Advance in Food Processing Technology**

**Subject Code : FTC609**

**Full Marks : 80+20=100**

**Hours : 42**

1. Scope of advances in food processing; historical developments; recent principles of food processing and preservation (06 Hrs)
2. Processing and preservation by heat – blanching, pasteurization, sterilization and UHT processing, canning, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying, etc. (06 Hrs)
3. Processing and preservation by low-temperature- refrigeration, freezing, CA, MA, and de hydro-freezing. (06 Hrs)
4. Processing and preservation by drying, concentration and evaporation-types of dryers and their suitability for different food products; ultra- filtration, reverse osmosis. (06 Hrs)
5. Processing and preservation by non-thermal methods, irradiation, high pressure, pulsed electric field, hurdle technology. (06 Hrs)
6. Use and application of enzymes and microorganisms in processing and preservation of foods; food fermentations, pickling, smoking etc; (06 Hrs)
7. Food additives: definition, types and functions, permissible limits and safety aspects. (06 Hrs)



**Subject : Advance in Food Processing Technology Lab**  
**Subject Code : FTC615**

List of Practical:

1. Processing and preservation UHT processing
2. Processing and preservation by heat dielectric heating, microwave heating, baking, roasting and frying, etc.
3. Processing and preservation by baking, roasting and frying.
4. Processing and preservation by low-temperature using nitrogen.
5. Processing and preservation by de hydro-freezing.
6. Study of different types of dryers
7. Evaluation and demonstration of solar dryer.
8. Processing and preservation ultra- filtration and reverse osmosis.
9. Processing and preservation by non-thermal methods, high pressure, pulsed electric field.
10. Use and application of enzymes and microorganisms in processing.
11. Determination of constitutions of preservatives to check permissible limit

### **Books**

1. Arsdel WB, Copley MJ & Morgan AI. 1973. Food Dehydration. 2<sup>nd</sup> Ed. Vols.I, II. AVI Publ.
2. Desrosier NW & James N.1977. Technology of Food Preservation. 4<sup>th</sup>Ed. AVI. Publ.
3. Fellows PJ. 2005. Food Processing Technology: Principle and Practice. 2<sup>nd</sup> Ed. CRC.
4. Jelen P. 1985. Introduction to Food Processing. Prentice Hall.
5. Potter NN & Hotchkiss 1997. Food Science. 5<sup>th</sup>Ed. CBS.
6. Potty VH & Mulky MJ. 1993. Food Processing. Oxford & IBH.
7. Ramaswamy H & Marcotte M. 2006. Food Processing: Principles and Applications. Taylor & Francis.

**Subject : Professional Practices (Common Paper)**  
**Subject Code : 602**

**Rationale:**

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests.

While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts.

The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

**Activities to be undertaken:**

Students are expected to undertake these activities:

1. Acquire information from different sources ( Print and electronic) on the topics of specialization and related to the subjects of II nd and final year. The class is to be divided in groups of not more than five to six students in a group and all groups are to be allotted topic of their choice. The topic should not be repeated to other group for originality of work to be performed by the group. This activity will develop interdependence and leadership among the students.
2. Prepare notes for given topic at point no 1. The notes will be in form of a project report, having all the sections of report. The report should not be of 30 – 50 pages.
3. Prepare presentation and Present the learning and finding on given topic in a seminar. The presentation should be prepared in Power Point module having more than 25 slides. All students should be asked to deal with suitable parts decided by the group itself.
4. Interact with peers to share thoughts. After the final presentation the students should be encouraged to interact with the faculty members, students’ fellows and other experts for suggestions and advanced and structured learning.
5. Undertake industrial visit of their area and choice. Prepare a report on industrial visit. Expert lectures on the topic selected may be invited for the students and these expert lectures also the students should be asked to prepare a report and present the same in seminar or have a group discussion before the expert and faculty members.
6. Develop entrepreneurial traits. Students group may be asked to have a field survey and product assessment and analysis for a product of their choice. Prepare a report for all the inputs of their requirement and submit it for evaluation.
7. To prepare for start ups. Expert lectures for exploring this option may be arranged as this is also a viable option and much talked about option for self employment and avail the encouragement by the government.

Based on the above rationales students will advised to develop traits under guidance of dedicated faculty members / mentors.