10. RESOURCE REQUIREMENT FOR FOOD TECHNOLOGY

10.1 Physical Resources

10.1.1 Space Requirement:

Library and LRDC	150 sq.m
Class Rooms (4 Nos. 18 sq.m. per room)	72 sq.m
Drawing Hall	32.5 sq.m

Other Space Requirements

Please refer to norms and standard given by AICTE

10.1.2 Equipment Requirement:

MICROBIOLOGY

Sr. No	Item	Qty	Tentative Cost (Rs)
1.	Autoclave	1	48,500/-
2.	Balance (Electronics) (300 g. – 0.001 L.C.)	1	28,500/-
3.	Colony Counter	1	5,150/-
4.	Colorimeter (Big)	1	22,500/-
5.	DO Analyzer	1	30,.000/-
6.	Fumigator	1	700/-
7.	Heating Mantle	1	624/-
8.	Incubator	2	60,000/-
9.	Incubator BOD	1	87,977/-
10.	Laminar Flow Bench	1	33,300/-
11.	Magnetic Stirrer (Hot Plate)	1	850/-
12.	Microscopes	3	15,000/-
13.	pH Meter	1	5,900/-
14.	Retort	1	25,000/-
15.	UV Cabinet	1	5,000/-
16.	Cooling Incubator	1	72,000/-
17.	Incubator Cum Shaker	1	90,000/-
18.	Centrifuge	1	35,000/-
19.	Vortex Mixing Machine	1	5,000/-
20.	Pressure Cooker 5, 10 liter	2	5,000/-
21.	Hot Air Oven/Glass Ware Sterilizer	1	25,000/-
22.	Water Bath	2	15,000/-

CEREALS, PULSES AND OIL SEEDS LABORATORY			
Sr. No	Item	Qty	Tentative Cost (Rs)
1.	Ball Grinding Mill	1	6,142/-
2.	Dehusker	1	23,750/-
3.	Grain Divider	1	19,250/-
4.	Grain Testing Mill	1	18,500/-
5.	Grinding Mill	1	15,000/-
6.	Plate Mill (Atta Chakki)	1	5,000/-
7.	Purity Work Board	1	2,398/-
8.	Seed Blower	1	27,115/-
9.	Universal Moisture Meter	1	11,612/-
10.	Wet and Dry Grinder	1	25,200/-
11.	Buhler Mill	1	10,00,000/-
12.	Rice Grader	1	10,000/-
13.	Pulse Milling Unit	1	50,000/-
14.	Popping Machine	1	10,000/-
15.	Noodle Press (Manual)	1	1,000/-
16.	Dehuller	1	40,000/-
17.	Polisher	1	50,000/-
18.	Gluten Press	1	20,000/-
19.	Verneer Calipers	3	1,500/-
20.	Screw Gauge	3	1,500/-
21.	Stone Mill	1	10,000/-
22.	Baking Oven	1	44,000/-
23.	Freezer (Ultra Low)	1	59,000/-
24.	Hot Air Oven	1	20,000/-
25.	Microwave Oven	1	12,200/-
26.	Mixer Grinder	1	2,300/-
27.	PASTA Making Machine	1	2,150/-
28.	Planetary Mixer	1	42,500/-
29.	Refrigerator (Display)	1	35,000/-
30.	Refrigerator 4 Door	1	48,000/-
31.	Beam Balance	1	10,000/-
32.	Electronic Balance	1	10,000/-
33.	Fermentation Cabinet	1	30,000/-
34.	Sheeting-cum-moulding Unit	1	20,000/-
35.	Proofing Chamber	1	30,000/-
36.	Biscuits Making Unit	1	1,00,000/-
37.	Muffle Furnace	1	15,000/-
38.	Color Grader (Kent Jones)	1	2,00,000/-
39.	Loaf Volume Meter	1	3,000/-
40.	Slicing Unit	1	5,000/-
41.	Heat Sealing Unit	1	2,000/-

MEAT FISH AND POULTRY PRODUCTS LABORATORY			
Sr. No	Item	Qty	Tentative Cost (Rs)
1.	Poultry slaughter unit (Lab Model)	1	50,000/-
2.	Meat Cutter	1	3,000/-
3.	Meat Mincer	1	25,000/-
4.	Emulsion Making Unit	1	25,000/-
5.	Deep fat Fryer	1	15,000/-
6.	Oven Toaster Grill	1	10,000/-
7.	Sausage filler	1	10,000/-
8.	Pressure Cooker 5 litre	2	10,000/-
9.	Hot Air Oven	1	20,000/-
10.	Deep Freezer	1	25,000/-
11.	Refrigerator	1	40,000/-
12.	Stainless Cook wares set	1	10,000/-
13.	Egg Candling unit	1	5,000/-
14.	Electronic Balance (500 gm.)	1	25,000/-
15.	Weighing Balance (10 Kg)	1	8,000/-
MILK AND MILK PRODUCTS LABORATORY			
1.	Butter Churner	1	17,500/-
2.	Butter Moister Balance		850/-
3.	Butter Weighing Scale	1	585/-
4.	Centrifuge Gerber	1	1,845/-
5.	Butter Worker	1	2,340/-
6.	Centrifuge solubility Index	1	6,600/-
7.	Cream Separator	1	15,025/-
8.	Deep Freezer	1	40,000/-
9.	Densitometer Bulk	1	6,500/-
10.	Hot Plate	1	500/-
11.	Magnetic Stirrer	2	3000/-
12.	Milk Tester	1	22,500/-
13.	Muffle Furnace	1	25,000/-
14.	Hand Refractometer(set)	1	5000/-
15.	Refractometer (Butyro)	1	5,000/-
16.	Softy Making Machine	1	22,500/-
17.	Solubility Index Mixer	1	4,630/-
18.	Water Bath Circulting	1	2,500/-
19.	Viscometer	1	15,000/-
20.	Infra red moisture meter	1	25,000/-

FRUITS AND VEGETABLE TECHNOLOGY LABORATORY			
Sr. No	Item	Qty	Tentative Cost (Rs)
1.	Centriguge	1	5,050/-
2.	Citrus Juicer	1	5,000/-
3.	Crown Corking Machine	1	5,000/-
4.	Food Processor	1	8,850/-
5.	Freezer	1	15,000/-
6.	Fruit Mill	1	7,400/-
7.	Gas Burner	1	2,000/-
8.	Hydraulic Juicer Press	1	13,250/-
9.	Juicer Screw	1	1,600/-
10.	Juicer (Vegetable)	1	2,500/-
11.	Microwave Oven	1	17,200/-
12.	Potato Peeling Machine	1	18,989/-
13.	PP Cap Sealing Machine	1	139/-
14.	Pulper 10 kg	1	10,000/-
15.	Refractometer (Table top)	1	41,265/-
17.	Sulphur Box	1	22,500/-
18.	Temperature Indicator Digital	1	900/-
19.	Tray Dryer	1	50,000/-
20.	Vacuum Filling Machine	1	50,000/-
21.	Peeling and Slicing Knives	4 each	1,000/-
22.	Stainless Steel Cookwares	1	10,000/-
23.	Bottling Unit (Filling and copping)	1	50,000/-
24.	pH meter	1	10,000/-
25.	Electronic Balances	1	1,00,000/-
26.	Hot Air Oven	1	20,000/-
27.	Carbonation Unit	1	10,000/-
28.	Hand Refractometer (full range) 0-32, 33-65, 66-90	2 each	48,000/-
29.	Steam Jacket Cattles (10 Kg capacity)	2	60,000/-
30.	Amla Pricking Machine	1	1,30,000/-
FOOD ANALYSIS AND QUALITY CONTROL LABORATORY			
1.	Centrifuge	1	8,050/-
2.	Demineralizer	1	6,345/-
3.	Distillation Unit	1	8,200/-
4.	Divider Gammet Type	1	15,995/-
5.	Fire Point Apparatus	1	3,400/-
6.	Flash Point Apparatus	1	4,200/-
7.	Lovibond Tintometer	1	2,18,406/-
8.	Micro Kjeldhal Apparatus	1	3,800/-
9.	Photo Electric colorimeter	1	22,500/-
10.	Polarimeter 200 ml	1	7,000/-

Sr. No	Item	Qty	Tentative Cost (Rs)
11.	Rotary Vacuum Evaporator	1	40,000/-
12.	Smoke Point Apparatus	1	2,000/-
13.	Spectrophotometer	1	2,50,000/-
14.	Water Bulb Constant	1	7,000/-
15.	Electronic Balance	2	20,000/-
16.	Top Loading Balance	1	18,000/-
17.	Physical Balance	4	8,000/-
18.	pH meter	1	10,000/-
19.	Hot Air Oven	1	14,000/-
20.	Vacuum Oven	1	20,000/-
21.	Sample Grinder 1	1	2,000/-
22.	Digestion Assembly	1	10,000/-
23.	Magnetic Stirrer	1	4,000/-
24.	Soxhlet Apparatus	1	10,000/-
25.	Refrigerator	1	30,000/-
26.	Steam Bath	1	5,000/-

PACKAGING TECHNOLOGY			
1.	Box Compression Tester	1	95,000/-
2.	Bursting strength tester	1	60,000/-
3.	Chain Metric	1	3,300/-
4.	Conductivity Meter	1	3,520/-
5.	Drop Tester	1	29, 950/-
6.	Gauge Metal Dial Type	1	3,000/-
7.	Hygrometer	1	500/-
8.	Puncture Resistance Tester	1	47,000/-
9.	Refrigeration Tutor	1	26,000/-
10.	Seal and Shrink Packing Machine	1	99,750/-
11.	Static Tensile Tester	1	30,250/-
12.	Stop Watch	1	450/-
13.	Substance Indicator	1	16,500/-
14.	Vacuum Packaging Machine	1	1,99,500/-
15.	Tensile strength Unit	1	50,000/-
16.	Humidity Chamber (Temp and RH controlled)	1	50,000/-
PROJECT LAB			
1.	Cabinet Dryer	1	60,000/-
2.	Can Reformer and Flanger	1	24,400/-
3.	Exhaust Box	1	32,500/-
4.	Mono Block Motor	1	6,050/-
5.	Seamer	1	22,900/-

Sr. No	Item	Qty	Tentative Cost (Rs)
6.	Seed Grader	1	49,650/-
7.	Beam Balance	2	10,000/-
8.	Drum Drier (small)	1	50,000/-
9.	Spray Drier (bench Model)	1	2,00,000/-
10.	Extruder (small)	1	2,50,000/-
11.	Vibro Extractor	1	50,000/-
12.	Ice-cream Freezer	1	50,000/-
13.	Fluidized Bed Drier	1	50,000/-
14.	Spray Dryer	1	6,00,000/-
15.	Plate Heat Exchanger	1	5,00,000/-
16.	Freeze drier	1	10,00,000/-
17.	Twin Screw Food Extruder	1	10,00,000/-

NOTE:
1. Some of the equipment mentioned in different laboratories may be shared.
2. The prices of various equipment given above are approximate. The actual prices may be ascertained from the suppliers.
3. The items 14-15 for Project Lab may be procured subject to availability of funds.

10.1.3 Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

10.2 Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE. The website www.aicte.ernet.in may be referred for downloading current norms and standards pertaining to technician courses.

11. EVALUATION STRATEGY

11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavor is to ensure the quality of the product which can be assessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students.

Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

11.2.1 Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles and solve problems. The formative evaluation for theory subjects may be caused through sessional/class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

11.2.2 Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

11.2.3 Project Work

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems, manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

11.2.4 Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

11.3 ASPECTS OF QUESTION PAPER SETTING

Validity and reliability are the most important considerations in the selection and construction of evaluation procedures. First and foremost are the evaluation tools to measure the specific outcomes for which they are intended to measure. Next in importance is reliability, and following that is a host of practical features that can be classified under the heading of usability.

For weightage of marks assigned to formative (internal) and summative (external) evaluation and duration of evaluation has been given in the study and evaluation scheme of the curriculum document. Teachers/Paper-setters/Examiners may use Manual for Students' Evaluation developed by National Institute of Technical Teachers' Training & Research, Sector-26, Chandigarh to bring objectivity in the evaluation system. The working group found it very difficult to detail out precisely the contents of subject on

languages and therefore teachers may send guidelines to respective examiners for paper setting to maintain objectivity in evaluation.

12. RECOMMENDATIONS FOR EFFECTIVE IMPLEMENTATION OF CURRICULUM

The following recommendations are made for effective implementation of this curriculum.

a) While imparting instructions, stress should be laid on the development of practical skills in the students.

b) Field visits be organised as and when required to clarify the concepts, principles and practices involved. For this purpose, time has already been provided in student centred activities in each semester

c) Extension lectures from professionals should be organized to impart instructions in specialized areas

d) There is no need of purchasing very costly equipment. Efforts may be made to establish linkages with local field organizations for this purpose

e) Considerable stress should be laid on personality development of the students, which is very essential for a diploma holder.

f) Teachers should instill competitiveness among the students for the development of professional skills.

g) Teachers should take interest in establishing linkages with relevant industry for imparting field experiences to their students.

h) Hobby clubs and other co-curricular activities be promoted to develop creativity in the students

i) Teachers should be sent for periodical training in the new areas relevant to their field of specialization.

j) Students should be given relevant and well thought of practice based project assignments. This will help students in developing creativity and confidence for their gainful employment (wage and self)

k) A project bank should be developed by the Food Technology Department of the polytechnic in consultation with industry in the state.