

CURRICULUM FOR THREE YEAR

DIPLOMA COURSE IN

=====
:AGRICULTURAL ENGINEERING :
: Effective from Session :
=====

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=====

=====
:Semester System :
=====

Prepared By

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: Curriculum Development Cell :
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INSTITUTE OF RESEARCH DEVELOPMENT
& TRAINING, U.P., KANPUR

APPROVED BY

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: BOARD OF TECHNICAL EDUCATION :
: U.P. LUCKNOW, :
:CORRECTED AS SYLLABUS COMMITTEE OF:
: B.T.E. MEETING HELD ON 04.05.2017
=====

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN AGRICULTURAL ENGINEERING
(Effective From)

I Semester

Curriculum							Scheme of Examination										
Periods Per Week							Theory					Practical					Grand
Le	Tut	Dr	Lab	Work	Tot	SUBJECT	Examination	Sess.	Total	Examination	Sess.	Total	Total				
c.	ori	aw	Shop	al			Marks	Marks	Marks	Marks	Marks	Marks	al				
al							Dur.	Marks		Dur.	Marks						
4	-	-	-	-	4	1.1 Foundational Communicaton	2.5	50	20	70	-	--	--	70			
3	1	-	-	-	4	1.2 Applied Mathematics-I(A)	2.5	50	20	70	-	-	-	70			
3	1	-	-	-	4	1.3 Applied Physics-I	2.5	50	20	70	-	--	--	70			
6	-	-	4	-	10	1.4 Applied Chemistry	2.5	50	20	70	3	40	20	130			
4	-	10	-	-	14	1.5 Engineering Drawing	3.0	50	20	70	-	-	-	70			
6	-	-	2	-	8	1.6 Agricultural Science	2.5	50	20	70	3	30	15	115			
<-----TOTAL----->							--	300	120	420		70	35	105	525		
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)													25				
TOTAL													550				

II Semester

3	1	-	-	-	4	2.1 Applied Mathematics-I(B)	2.5	50	20	70	-	-	-	70	
3	1	-	4	-	8	2.2 Applied Physics-II	2.5	50	20	70	3	40	20	130	
5	1	-	2	-	8	2.3 Applied Mechanics	2.5	50	20	70	3	40	20	130	
6	2	-	4	-	12	2.4 Mat. & Rural Construction Technology	2.5	50	20	70	3	30	15	115	
-	-	-	-	14	14	2.5 Workshop Practice	--	--	--	--	4	60	30	90	
<-----TOTAL----->							--	200	80	280		170	85	255	535
Games/NCC/Social and Cultural Activities + Discipline (15 + 10)													25		
TOTAL													560		

- NOTE:-
- (1) Each period will be 50 minutes duration.
 - (2) Each session will be of 16 weeks.
 - (3) Effective teaching will be at least 14 weeks.
 - (4) Remaining periods will be utilised for revision etc.

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN AGRICULTURAL ENGINEERING
(Effective From)

III Semester

Curriculum						Scheme of Examination																
Periods Per Week						S U B J E C T					Theory					Practical					Gr- nd	
Le- c- t- u- r- e- s	Tut- o- r- i- a- l	Dr- a- w- i- n- g	Lab- o- r- a- t- o- r- y	Work- s- h- o- p	Tot- a- l																	
5	2	-	3	-	10	3.1	Hydraulics	2.5	50	20	70	2.0	30	15	45	115						
5	-	-	4	-	9	3.2	Soil Mech. Soil Science	2.5	50	20	70	3	40	20	60	130						
3	-	-	8	-	11	3.3	Surveying & Levelling	2.5	50	20	70	6	50	20	70	140						
2	-	-	5	-	7	3.4	Introduction To Computer	-	-	-	-	3	60	30	90	90						
-	-	-	-	8	8	3.5	Agricultural Equipment Workshop Practice	--	--	--	--	6	50	25	75	75						
15	2	-	20	8	45	<-----TOTAL----->					--	200	80	210	230	110	340	550				
																			Games/NCC/Social and Cultural Activities + Discipline (15 + 10)		25	
																			TOTAL		575	

IV Semester

4	-	-	-	-	4	4.1	Functional Communicaton	2.5	50	20	70	-	--	--	--	70					
4	2	-	3	-	9	4.2	Mechanics of Solids	2.5	50	20	70	3.0	40	20	60	130					
5	-	-	3	-	8	4.3	Farm Power Engg. & Non-con- ventional Energy	2.5	50	20	70	3	40	20	60	130					
5	-	-	4	-	9	4.4	Electrical Engg. & Rural Electrification	2.5	50	20	70	3	40	20	60	130					
-	-	-	-	8	8	4.5	Agriculture Engg. Drawing	3.0	100	40	140	-	--	--	--	140					
5	-	-	-	-	5	4.6	Dairy and Food Engineering	2.5	50	20	70	-	--	--	--	70					
3	-	-	2	-	5	4.7	Energy Conservation	2.5	50	20	70	3	20	10	30	100					
26	2	-	12	8	48	<-----TOTAL----->					--	400	160	560	--	140	70	210	770		
																			Games/NCC/Social and Cultural Activity/Community Development work Discipline (30 + 20)		25
																			Aggregate		795

NOTE:-

- (1) Each period will be of 50 minutes duration.
- (2) Each session will be of 16 weeks.
- (3) Effective teaching will be at least 14 weeks.
- (4) Remaining periods will be utilised for revision etc.
- (5) 4 weeks structured and supervised, branch specific, task oriented industrial/field exposure to be organised after IV Semester. There will be 40 marks for this exposure and will be awarded in VI Semester during Project Viva Exam. (Sess. Marks 20 & 20 in viva) Training shall be in any one of the following fields;

- i. Agricultural Workshop
- ii. U. P. Agro Ind. Corporation
- iii. Tractor training & testing center.

STUDY AND EVALUATION SCHEME FOR
THREE YEARS (SIX SEMESTER) DIPLOMA COURSE IN AGRICULTURAL ENGINEERING
(Effective From)

V Semester

Curriculum						Scheme of Examination															
Periods Per Week						S U B J E C T					Theory					Practical					Grand
Le	Tut	Dr	Lab	Work	Tot	S U B J E C T	Examination	Sess.	Total	Examination	Sess.	Total	Examination	Sess.	Total	Total					
c.	ori	aw	Shop	al	al		Dur.	Marks	Marks	Dur.	Marks	Marks	Dur.	Marks	Marks	Marks	al				
-	-	-	4	-	4	5.1 Integrative Communicaton	-	--	--	-	3	40	20	60	60						
5	-	-	4	-	9	5.2 Minor Irrigation & Tube Well Engineering	2.5	50	20	70	1	10	5	15	85						
5	-	-	8	-	13	5.3 Post Harvest Tech. & Agro Based Industries	2.5	50	20	70	3	50	20	70	140						
7	-	-	-	-	7	5.4 Estimationg & Costing	4.0	100	40	140	-	--	--	--	140						
2	-	-	3	-	5	5.5 Agricultural, Industrial Finance & Rural Entrepreneurship	2.5	50	20	70	Viva	50	20	70	140						
6	-	-	4	-	10	5.6 Green House Technology, Hydroponics & Aquaponics Engg.	2.5	50	20	70	#Viva	50	20	70	140						
29	-	-	19	-	48	<-----TOTAL----->	--	300	120	420	--	200	85	285	705						
Games/NCC/Social and Cultural Activity/Community Development work Discipline (15 + 10)																25					
Aggregate																730					

VI Semester

4	-	-	-	-	4	6.1 Environmental Education* & Disaster Management	2.5	50	--	--	-	--	--	--	--
6	-	-	4	-	10	6.2 Irrigation & Drainage Engineering, Rain Water Harvesting	2.5	50	20	70	2	20	10	30	100
6	-	-	8	-	14	6.3 Soil-Water Conservation & Land Reclamation Engg.	2.5	50	20	70	3	50	20	70	140
6	-	-	4	-	10	6.4 R.C.C. & Steel Structure	2.5	50	20	70	3	50	20	70	140
4	-	-	4	-	8	6.5 Farm & Land Dev. Machinery	2.5	50	20	70	3	40	15	55	125
2	-	-	-	-	2	6.6 Project Work	-	--	--	--	#Viva	100	50	150	150
						6.7 Training Report of Industrial/Field Exposure done at the end of IV Semester & at the end of V Semester					#Viva	20	20	40	40
											#Viva	20	20	40	40
28	-	-	20	-	48	<-----TOTAL----->	--	200	80	280	--	300	155	455	735

Games/NCC/Social and Cultural Activity/Community Development Work + Discipline (15 + 10) | 25 |

NOTE:- (i) Each period will be of 50 minutes duration. |-----|

(ii) Each session will be of 16 weeks. |-----|

(iii) Effective teaching will be at least 14 weeks. |-----|

(iv) Remaining periods will be utilised for revision etc. |-----|

(v) Student centred activity includes games, NCC, Social & cultural activities, terminal exam and class tests, etc. |-----|

(vi) Each student/group of Maximum 5 students will be given live problems to be solved. Three hours per week has been provided in the scheme. This time should be given at stretch in the end. Project will be under the guidance of teachers |-----|

(vii) Field visits and extension lectures are to be organised and planned well in advance at Polytechnic level as per need |-----|

(viii) (*) It is compulsory to appear & to pass in examination, But marks will not be included for division and percentage of obtained marks. |-----|

(ix) 4 to 6 weeks structured field exposure/training during/end of the V semester in any one of the fields given below |-----|

i. Soil & Water Conservation Training Centre. |-----|

ii. Minor irrigation. |-----|

iii. Agro processing unit iv. Construction unit. |-----|

Aggregate | 760 |

30% Carry Over of I & II. | 337 |

70% Carry Over of III & IV | 959 |

100% Carry Over of V & VI | 1490 |

Grand Total | 2786 |

THREE YEARS DIPLOMA IN AGRICULTURAL ENGINEERING
CONTENTS

Sl.No.	Particulars	Page No.
i.	Study and Evaluation Scheme	
ii.	Main features of the curriculum	1
III.	List of Experts	2
iv.	Need Analysis	3
I.	Profile development	4
II.	Job opportunities	5
III.	Job activities & activity analysis	6 - 13
IV.	Course objectives	14
V.	Abstracts of curriculum areas	15
VII.	Detailed course contents	
1.0	I Semester	
1.1	Fundamental Communication	16 - 20
1.2	Applied Mathematics-I(A)	21 - 22
1.3	Applied Physics-I	23 - 24
1.4	Applied Chemistry	25 - 29
1.5	Engineering Drawing	30 - 32
1.6	Agricultural Science	33 - 34
2.0	II Semester	
2.1	Applied Mathematics-I(B)	35 - 36
2.2	Applied Physics-II	37 - 39
2.3	Applied Mechanics	40 - 43
2.4	Material & Rural Construction Technology	44 - 47
2.5	Workshop Practice	48 - 50
3.0	III Semester	
3.1	Hydraulics	51 - 54
3.2	Soil Mechanics & Soil Sciences	55 - 58
3.3	Surveying & Levelling	59 - 61
3.4	Introduction TO Computer	62 - 64
3.5	Agricultural Equipment Workshop Practice	65
4.0	IV Semester	
4.1	Functional Communication	16 - 20
4.2	Mechanics of Solids	66 - 69
4.3	Farm Power Engineering & Non Conventional Sources of Energy	70 - 73
4.4	Electrical Engineering & Rural Electrification	74 - 76
4.5	Agricultural Engineering Drawing	77 - 78
4.6	Dairy & Food Engineering	79 - 80
4.7	Energy Conservation	79 - 80
5.0	V Semester	
5.1	Integrative Communication	
5.1	Minor Irrigation & Tubewell Engineering	81 - 83
5.2	Post Harvest Technology & Agro Based Industries	84 - 87
5.3	Estimating & Costing	88 - 90
5.4	Agricultural, Industrial Finance & Rural Entrepreneurship	91 - 93
5.5	Green House Technology, Hydroponics and Aquaponics Engineering	94 - 97

6.0	VI Semester	
6.1	Environmental Education & Disaster Mgt.	98 -100
6.2	Irrigation & Drainage Engineering	101 -103
6.3	Soil,Water Conservation & Land Reclamation Engg.	104 -107
6.4	R.C.C. & Steel Structures	108 -111
6.5	Farm & Land Development Machinery	112 -115
6.6	Project	116
VIII	Staff Structure & Qualification	117
IX	Space Structure	118 -121
X	List of Equipment	122 -142
XI	Learning Resource Material	143
XII	Annexure - I	144
XIII	Annexure - II	145
XIV	List of Books	146 -147

MAIN FEATURES OF THE CURRICULUM

1. COURSE TITLE : DIPLOMA IN AGRICULTURAL ENGG.
2. DURATION OF COURSE : Three Years(Six Semester)
3. TYPE OF COURSE : Full Time, Semester Pattern.
4. ENTRY QUALIFICATION : Passed High School With Agriculture
35% Marks
5. INTAKE : 60
6. ADMISSION CRITARIA : Through Joint Entrance
Examination

The experts who have contributed in the Semester System of

6

Corrected and Approved By B.T.E. on Dated 04.05.2017

curriculum held on 04.04.15.

1. Sri N. K. Naresh Principal G.L.I., Agra
2. Sri K. K. Srivastava Principal, G.P. Ambedakar Nagar
3. Sri Hari Om Singh Principal, G. P., Sravasti
4. Sri Sanjeev Awasthi HOD, J.L.Poly. Mahamudabad, Sitapur
5. Sri V. S. Rai Retd. Lect, G. P. Gazipur
6. Sri Dinesh Sharma Lecturer, I. R. D. T., Kanpur

The experts who have contributed in the revision of curriculum held on 01.02.16 at I.R.D.T., U.P., Kanpur

1. Sri A. K. Singhal Retd. Assistant Professor (Agri. Engg.)
C. S. A. University of Agriculture
& Technology, Kanpur
2. Dr. Lal Mani Asstt. Prof. C.S.A., Kanpur
3. Sri S. K. Sachan Associate Prof., C.S.A., Kanpur
4. Sri N.K. Naresh Principal, G.L.I., Agra
5. Sri Sanjeev Awasthi Lect., Agri. Engg.
J.L.N. Poly., Mahmoodabad
6. Sri K. K. Srivastava Lect., Agri. Engg. G. P., Lucknow
7. Sri Vijay Shanker Rai Lect., Agri. Engg. G.P., Ghazipur
8. Sri Harish Kumar Saxena Lect., Agri. Engg. G.P., Moradabad
9. Sri Ashish Gupta Dy. Director, I.R.D.T., U.P., Kanpur

The experts who have contributed in the review and revision of curriculum held on 04.07.16 and at I.R.D.T., U.P., Kanpur

1. Sri A. K. Singhal Retd. Assistant Professor (Agri. Engg.)
C. S. A. University of Agriculture
& Technology, Kanpur
2. Sri N.K. Naresh Principal, G.L.I., Agra
3. Sri K. K. Srivastava Lect., Agri. Engg. G. P., Lucknow
4. Sri Harish Kumar Saxena Lect., Agri. Engg. G.P., Moradabad
5. Sri N. K. Sharma Bharat Heavy Machine, Panki Industrial
Estate Site-4, Kanpur
6. Dr. Prasoon Verma Sr. Scientist, Agri. Engg.
I.P.R.I, Kanpur
7. Sri Ashish Gupta Dy. Director, I.R.D.T., U.P., Kanpur

LIST OF EXPERTS

A Curriculum Workshop for Development of Curriculum on the Subject “Energy Conservation” was held on 22nd January, 2018 at NITTTR, Chandigarh. The following participated in the workshop:-

S. No.	Name, Designation and Official address
From Field/Industries/Institutions of Higher Learning	
1.	Shri Jotinder Singh, Engineer-in-Chief(Retd.) Punjab State Power Corpn. Ltd.(PSPCL), Punjab
2.	Shri Punit Sharma, Asstt.General Manager, Electrical & Energy Management, Godrej Appliances Ltd. Mohali, Punjab
3.	Ms. Anu Singla, Associate Professor, Chitkara University, Rajpura, Punjab
4.	Shri Girish Kumar, UP New and Renewable Energy Development Authority (UPNEDA), Lucknow, U.P.
5.	Sh. Lal Ji Patel, TBO/ CDC Officer, IRDT Kanpur, U.P.
6.	Shri Ravinder Kumar, Research Assistant, IRDT, Kanpur, U.P.
From NITTTR, Chandigarh	
7.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, Coordinator

NEED ANALYSIS

It was considered essential to revise the curriculum of diploma course in Agricultural Engineering to accommodate new areas of technology as well as update and modernise the existing course contents so as to make it more relevant to the needs of the world of work. Accordingly, workshops were organised to look into the gaps in the existing curriculum and revise the same. Number of professionals representing various field organisations, higher technological institutions and polytechnics were involved to update the curriculum of agricultural engineering.

Experts from the field and higher technological institutes emphasised the need of making the course more technology oriented and practice based. Need for inclusion of course on computer application, environmental awareness, entrepreneurship development and linkage of polytechnics with the world of work was also emphasised. Experts from the field and higher technological institutes were also of the view that curriculum should be broad based in nature so as to provide large base of employment and flexibility in functioning.

Based on the above, the curriculum of agricultural engineering was revised and during revision topics on entrepreneurship development, non conventional sources of energy, environmental pollution and control, safety procedures, banking, design of reinforced cement concrete and steel structures and agro based industries have been included in the curriculum.

PROFILE DEVELOPMENT

A tool in form of a questionnaire for getting informations about job opportunities, man power requirements and job activities of diploma holders in agricultural engineering was designed and sent to various organisation, industries, higher technological institutes and polytechnics.

Feed back from experts of above organisations, industries higher technological institutes and polytechnics was taken through questionnaire, personal interviews, was analysed and a draft structure of curriculum was prepared in tne workshop held on 19th and 20th Feb. at Lucknow.

The course outline,detailed course contents and resource input was developed in the workshop adopting the following procedure.

- (i) Listing job potential and job activities.
- (ii) Analysing activities into knowledge and skill.
- (iii) Determining the course objectives.
- (iv) Deriving the subject area from course objectives.
- (v) Planning horizontal and vertical organisation of the subjects.
- (vi) Development of study and evaluation scheme.
- (vii) Development of detailed course contents and coverage time keeping in view the knowledge and skill requirements.
- (viii) Determination of resource input in terms of human resources and information resources.

Review of this draft of the structure of curriculum was done in a workshop held at I.R.D.T., U.P.,Kanpur through a group of experts from field, higher technological institutes and polytechnics.

It is hoped that revised curriculum of diploma in Agricultural Engineering will be useful in producing the desired type of middle level trained manpower for agricultural world of work.

JOB OPPORTUNITIES

Sl.No.	Name of Deptt.	Name of Post
1.	Agriculture	
	(a) Ground water cell (Tubewell & minor irrigation)	Supervisor/J.E.
	(b) Soil & Water Conservation	Supervisor/J.E.
	(c) Non Conventional Energy Sources	Supervisor/J.E.
	(d) Agricultural Engineering	Supervisor/J.E.
2.	Minor Irrigation & Tubewell Corporation	Supervisor/J.E.
3.	Command Area Development Project	Supervisor/J.E.
4.	Soil Conservation	Supervisor/J.E.
5.	Agro Industrial Corporation	
	(a) Work Shop	Foreman/Supervisor
	(b) Marketing of Tractors, Implement, Seeding & Harvesting Equip.	Supervisor
6.	Development Corporation	
7.	National Seed Corporation	Supervisor
8.	State Formers Corporation	Supervisor
9.	Fertilizer Corporation of India	
	(a) Feed plant	Incharge
	(b) Fertilizer Plant	Incharge
10.	Ware Housing Corporation	J.E.
11.	UP State Krishi Utpadan Mandi Parishad	J.E.
12.	Rice Mills	Supervisor
13.	State Forest Department	Supervisor Machinery (Soil Conservate)
14.	Banks, UP State Coop Krishi Avam Gramya Bank Ltd.	Tech. Supervisor/J.E.
15.	Research & Extention Deptt. of Agriculture	Research Assistant
16.	Manufactures of Tractors & Agro implements	Supervisor/Foreman/ Sales Representative
17.	Teaching Institute	Asstt.Lect./Foreman
18.	Mandal Vikas Nigam	J.E.
19.	Krishi Vigyan Kendra	J.E.
20.	Town & Country Planning	J.E.
21.	Gram Vikas Sansthan, Bakshi Ka Talab	Supervisor
22.	U.P. Jal Nigam	Supervisor/J.E.
22.	U.P. Khadi Gramodyog Board	Supervisor/J.E.
23.	Tractor Krishi Yantra Workshop	Supervisor/Foreman
24.	Auto Tractors Ltd.	Supervisor/Foreman
25.	Appropriate Technology Deve. Association	J.E.
26.	Zila Gram Vikas Abhikaran	A.D.O.
27.	Entrepreneurs	
	(a) Manufacturers of	
	i. Agricultural implements	
	ii. Pump sets	
	iii. Fibre Processing	
	iv. Crop Processing	
	(b) Repair & Maintenance Centre of Agri.Implements, Pump Set etc.	

JOB ACTIVITIES

Sl.No.	Name of Activities
1.	Surveys the land and water resources of command areas.
2.	Supervises Land levelling operations.
3.	Prepares plans for surface & sub surface water conveyance system.
4.	Supervises construction of farm structures.
5.	Assists in planning and execution of the schemes for
	(i) Rain fall
	(ii) Run off
	(iii) Water harvesting and its recycling
	(iv) Water shed management
6.	Interprets production drawings.
7.	Procures raw materials.
8.	Assists in quality control in production process of the products.
9.	Controls labour for optimum production.
10.	Diagnose faults in equipment/machinery.
11.	Estimates the repair cost including requirement of spares.
12.	Procures spares and prepare their inventory.
13.	Tests the equipment and machinery for desired performance.
14.	Conducts demonstration of various products.
15.	Markets the products.
16.	Provides customer hire service.
17.	Assists farmer in arranging finance for land development work.
18.	Plans and executes land reclamation works.
19.	Supervises land development work.
20.	Performs after sales service to agricultural implements.
21.	Survey for the feasibility of tubewells.
22.	Installs trial bores for the area where such sources are lacking
23.	Selects bore size for a given situation.
24.	Selects pumps, power units and pipe line for a pump house.
25.	Prepare estimates and cost for distribution lines for installation of tube wells.
26.	Supervises installation and trial run of a tube well.
27.	Supervises rejuvination of old choked tube wells.
28.	Assists in determining aquifer parameters by performing pump test.
29.	Supervises operations, maintenance and repair of irrigation pumping sets.
30.	Demonstrates and popularise use of improved agricultural implements.
31.	Guides the farmers for the efficient use of tubewells, pumping sets and other lifting devices like wind mill etc.
32.	Collects data for pre & post monsoon water table of observation well.
33.	Supervises installation & maintenance of biogasplant, wind mills, solar pumps, solar crop dryer and other non conventional energy equipments.
34.	Guides the farmers in arranging finance for purchasing non conventional energy source equipments.
35.	Guides the fabricators for standard design and quality of equipments.
36.	Guides the farmers for operation and maintenance of tractors and other allied equipments
37.	Supervises the construction of drainage & irrigation system of fields.

38. Plans and constructs soil and water conservation structure.
39. Plans the layout of farms.
40. Supervises operation maintenace & servicing of land development equipments.
41. Supervises installation, errection and commissioning of seed processing plants.
42. Supervises storing of processed seeds.
43. Supervises storage of food grains.
44. Operates and maintains grain handling equipments and storage structures.
45. Supervises handling, operations & Maintenance of rice processing machinary.
46. Assists farmers in preparing loan application for agricultural equipments.
47. Prepares feasibility report for loan.
48. Scrutinises applications for loand with reference to assets & liabilities.
49. Does liason between bank & loanee.
50. Suggests new schemes for advances for new Bank Loan.
51. Assists in testing and evaluation of finished products as per BIS.
52. Trains the trade men.
53. Conducts experiments on soil and water
54. Helps in research and extension works to engineers.
55. Supervises flow operation of the manufacture of tractors & other implements.
56. Estimates the cost of maierials and equipments.
57. Establishes services & costermer hiring service centres for related agricultural deptt.
58. Supervises handling, operation & maintenance of vegetable & fruit storage machines.
59. Prepares ketchup, Jam, Jelly and squash of different fruit & vegetable.
60. Supervises the preservation of different fruit & vegetable

ANALYSIS OF ACTIVITIES INTO KNOWLEDGE AND SKILLS

Sl.No.	Name of Activities	Knowledge	Skill
1.	Surveys the land and water resources of command areas. land Prudent resources	Civil Engineering Surveying Cham survey compass survey, plan table survey, area calculation , Theodolite, levelling.	Surveying of & water & levelling
2.	Supervises Land levelling operations. Initiative hard working.	Surveying, Levelling equip- ments, methods.	Levelling
3.	Prepares plans for surface & sub surface water conveyance for Thrifty system. perposes types	Open channel irrigation pipe irrigation their types and application. Civil Engineering drawing and surveying. Hydraulics.	Making plans irrigation for various of terrain.
4.	Supervises construction of farm structures. construction Conscien- per tious.	Various materials used for construction work. Masonry work techniques reads Civil Engineering drawings. Labour management.	Test of materials as requirement of standards.
5.	Assists in planning and execution of the schemes for rainfall Conscientious. (i) Rain fall (ii) Run off (iii) Water harvesting and its recycling (iv) Water shed management	Hydrology. Collection of data for rainfall & run-off, irrigation.	Measurement of
6.	Interprets production drawings. drawings Analytical drawing correctly to job	Basic Engineering drawing Mach.Engg.drawing Assembly of farm machinery & tractors materials.	Roads assembly Interprets justment workers about requirements.
7.	Procures raw materials. economical Quality materials conscien- tious.	Materials, their charecter- stics and application. Estimating & costing of materials. Purchase procedufe. Inventory controle.	Selection of & suitable
8.	Assists in quality control in production process of job in Quality products. carpentary,smithy, Conscientious shop economical systemetic.	Work shop processes. Machining processes. Standards of quality supervisory practices.	Quality work foundry machine etc.
9.	Controls labour for optimum production.	Layout management. Labour Laws.	Cooperative
10.	Diagonose faults in equipment/machinery. machinary Safety tractors. Conscien- use of tious. and inst- dignosing	Form equipment & implements tractors, their assembly. Operation of machinery and equipment. System of fault finding,working of various cycles.	Dessemble the equipment & Make correct various tools ruments for faults.

11. Estimates the repair cost including requirement of spares. cost Cost and the time Conscien- time tious. Maintinance	Repair cost estimation process of repair of various parts, machining processes.	Estimation of keeping in view (i) Spare Cost (ii) Machining (iii)
12. Procures spares and prepare their inventory. proper Quality and the spares. cost cons- cientions.	Inventory controle Methods basic mechanism and spare parts with and specification.	Preparation of inventory of
13. Tests equipments and machinary for desired performance. cycles/equipments methodo- logical.	Testing procedures,proper use of instruments	Test
14. Conducts demonstration of various products. the working Conscien- machinary to the tious. satisfaction	1. Agricultural inputs 2. Machinary & their application 3. Construction & working of farm machinary. 4. Operation of farm machinary. 5. Rural Socialogy	Demonstrates of farm uses to their
15. Markets the products. Communica- skill tive con- vincing	Sales, Marketing & Management principles. Salient features of products.	Marketing skill Communication
16. Provides costumer hire service. skill Polite & skill convincing	Agriculture economics proce- dure of hire purchase	Communication demonstration
17. Assists farmer in arranging finance for land development skill Cooperative work.	Financing agencies & Their term and condition of giving loan/subsidiary.	Communication
18. Plans and executes land reclamation works. Methodo- logical reclamation	Land reclamation methods & selection of machinary, working and application of machinary C.P.M. & PERT Techniques Time Schedule	Management Techniques Exucution of land work
19. Supervises the land development work of Cooperative equipment development implement	Civil Engineering Surveying Soil sampling Land development methods Water and soil conservation method Land Developement Machinary operation of land development machniary.	Fault defection i) Civil Survey ii) Land machinary &
20. Perform after sales services to Agricultural material Quality Implements. estimates conscein- men and tious. effectively.	Preparation of plan for water and soil conservation Drawing, Estimating & costing methods.	Prepare plan, & cost Management of machinery
21. Survey for the feasibility of tube well. survey, Sincere of tube hardworking water analytical	Site selection,spacing & type of tubewells, suitability & availilbility of good ground water	Conducts Identify type well analyse table & quality

<p>22. Installs trial bores for the area where such sources are not available. Installing, testing & Safety men & consceintious</p>	<p>Selection of site for trial bores, procedure of installation, sources of trial bores management of men & Consceintious</p>	<p>management of machinery</p>
<p>23. Selects bore size for a given situation. Suitable size Consceintious boring as per ground about layout maps specification & quality of work</p>	<p>Hydraulics of wells,</p>	<p>selects & size of availability of water, read</p>
<p>24. Selects pumps, power units and pipe line for a pump house. pumps Specification movers consceintious</p>	<p>Different types of pumps, construction & working of prime movers, electrical distribution system & fitting.</p>	<p>Selection of and prime</p>
<p>25. Prepare estimates and cost for distribution lines for schedule, Cost installation of tube wells. mate- Consceintious given/ market rate. estimate & cost</p>	<p>Estimating and costing of service connection, pumping sets and other accessories.</p>	<p>Reads rate select suitable materials of from available prepares of materials.</p>
<p>26. Supervises installation and trial run of a tube well, Safety choked consceintious.</p>	<p>Causes of sick wells, principles of rejuvination of tube well</p>	<p>Diagnose sick rejuvinate tube wells</p>
<p>27. Supervises rejuvination of old choked tube wells. persons Safety consceintious.</p>	<p>Procedure of Installation of of tubewell, trial testing/ procedures, human relation & management.</p>	<p>Management of and machinery.</p>
<p>28. Assists in determining aquifer parameters by performing pump Cooper- test. ative.</p>	<p>Aquifer parameter, pump tests</p>	<p>Pump testing</p>
<p>29. Supervises operations, maintenance and repair of irrigation pumping sets. faults cooperative Manage- sincere. &</p>	<p>Working of irrigation pump Troubles in working of pumps repair and maintenance of pumps and precautions. equipment, estimate of cost precaution, in manufacture.</p>	<p>Operates pumps diagnose remove defects. ment of workers</p>
<p>30. Demonstrates and popularise use of improved agricultural skill Extrovert implements. agricultural Innovative initiative.</p>	<p>Agricultural processes, agricultural implements, working principles use and salient feature communication tech., knowledge of characteristics of various other similar equip.</p>	<p>Demonstration use of implements.</p>

31. Guides the farmers for the efficient use of tubewells, main- Cooperative pumping sets and other lifting devices like wind mill etc. tubewell communication of skill	Types of tubewell machinery, working principles of pumps and prime movers.	Operation and tenance of machinery, use pumping sets Measurement of table, rainfall ing.
32. Collects data for pri & post monsoon water table of water Initiative observation well. record drive sincerity	Water table fluctuation, rain fall data recording, measurement of water table. Basic meterology.	Installation of conventional equipment, of machinery & ance.
33. Supervises installation & maintenance of biogasplant, wind non- Initiative mills, solar pumps, solar crop dryer and other non energy drive, conventional energy equipments. management co-oprative men.	Feasibility, site selection, construction & working of non conventional energy equipment precautions in use & maintenance.	Communication & conditions of giving loan/subsidiary.
34. Guides the farmers in arranging finance for purchasing non skill Cooperative conventional energy source equipments.	Financing agencies & terms & conditions of giving loan/subsidiary.	Read & m/c drawing. ment of measuring
35. Guides the fabricators for standard design and quality of interpret safety equipments. Measure- conscient- dimensions with ious instruments.	Basic & machine drawing standard specifications of equipment/implements Basic manufacturing processes and materials.	Drive Tractors service & minor of tractors. Measurement of water situation, construction estimating
36. Guides the farmers for operation and maintenance of tractors & tractor Systemetic and other allied equipments repair patience.	Tractor, working principles & circuits, selection criteria of tractors, operation & maintenance of tractors.	Civil Engg. Drawing, material & construction tech. masonry work, RCC & steel structure, Soil properties, hydraulics.
37. Supervises the construction of drainage & irrigation system in varied Quality & of fields. tests of cost materials conscient- skill. ious.	Materials & construction tech. Structurs of various types & their application, masonry work, RCC & steel structure, water measurement devices.	Estimating & building other related for a farm.
38. Plans and constructs soil and water conservation structure. civil Cost conscient- ious.	Civil Engg. Drawing, material & construction tech. masonry work, RCC & steel structure, Soil properties, hydraulics.	Dignose the in machines. common faults and trouble in machinery.
39. Plans the layout of farms. consting of Aesthetic materials and imaginative. items of	Basic of form building planning for various require- ment as per location of farm special reaquirement of various facelaties, Civil Engg. Drawing.	Install & grader of seed processing
40. Supervises operation maintenace & servicing of land faults Safety development equipments. consciet- ious.	Operation and working of land development equipments, common faults and trouble in machinery.	
41. Supervises installation, errection and commissioning of seed errect seed safety processing plants. minature size. consciet- plant. ious.	Construction, working & application, processing, basic machine drg. errection	

42. Supervises storing of processed seeds. seed Careful.	installation of equipment & use. Trial test methods. Storing procedure,precaution	Supervision of storage.
43. Supervises storage of food grains. of seeds careful.	Storing procedure and plant, precautions.	Proper storing
44. Operates and maintains grain handling equipments and storage grain Safety structures. storage conscientious.	Construction and working of grain handling and storage equipment & structures.	Operation of handling and equipment
45. Supervises handling, operations & maintenance of rice processing Safety processing machinery. Maintain Rice unit.	Construction and working of rice shellers. Operation and maintenance of rice milling machinery.	Operate Rice machinery. processing
46. Assists farmers in preparing loan application for act/communication Polite. agricultural equipments. effectively.	Agriculture inputs in which assistance is offered. Communication.	Inter with farmers
47. Prepares feasibility report for loan. feasibi- Self Study	Factor about suitability, marketability labour, raw material etc.	Preparation of report.
48. Scrutinises applications for loan with reference to assets Prudent & liabilities. initiative.	Knowledge of evaluation of assets & liabilities.	
49. Does liason between bank & loanee. Verbal/Communication Communi- cative.	Communication	skill.
50. Suggests new schemes for advances for new Bank Loan. proposal Prudent a new honest. /cottage / or repair	Modern development, Rural Sociology,agricultural economics,Agricultural Science,allied sector occupation.	Prepare project for setting up small scale other industry shop.
51. Assists in testing and evaluation of finished products as product in Quality per BIS. improve- conscientious.	BIS for testing equipment requirement of finished product.	Testing of field,suggest ment.
52. Trains the trade men.	Industrial management safety practice in shop flore.	
53. Conducts experiments on soil and water. Systemetic and water, approach. water the data.	Soil Science, Testing proce- dure as per BIS of soil and water.	Arrangement for testing soil tests soil & conclusion from
54. Helps in research and extension works to engineers. Cooperative	Extension works: Principle & and extension scheme .	
55. Supervises flow operation of the manufacture of tractors & Safety other implements. study conscientious	Manufacturing process know- ledge of parts is assembly time motion study.	Drawings time motion
56. Estimates the cost of materials and equipments. skill of Quality suitable conscientious	Material, specification, applications, estimation	Selecting convinal &

of proper material will in law.		methods purchase procedure inventory controle.	mater purchase quality
57. Establishes services & costermer hiring service centres for the P.R.G. related agricultural deptt.		Knowledge of various agrl. crops & seasons crops harve-	Demontating functions &
58. Supervises handling, operation & maintenance of vegetable & cold fruit storage machines.		Construction of cold storage Airconditioning and refrige- ration unit. Working and maintenance of cold storage plant.	Operation of storage unit.
59. Prepares ketchup, Jam, Jelly and squash of different jam, jelly, Innovative & vegetable.		Principle of ketchup, jelly, squash & jam manufacture, construction & working of equipment , estimate of cost precaution, in manufacture.	Preparation of
60. Supervises the preservation of different fruit & vegetable skill Quality practice.		Principle of preservation. Preservatives,method of packing.	Preservation and packing

COURSE OBJECTIVES

- (A) To develop capabilities for understanding the engineering principle and techniques required for solving agricultural problem.
- (i) Irrigation and drainage.
 - (ii) Land preparation & conservation.
 - (iii) Processing of crop, its storage & transportation.
 - (iv) Farm equipment and machinery.
 - (v) Form power and non conventional sources of energy.
- (B) To develop awareness of various activities involved in agricultural engineering.
- (C) To develop professional skills in technology for:
- (i) Installation
 - (ii) Operation
 - (iii) Maintenance
 - (iv) Servicing
 - (v) Marketing
 - (vi) Construction
 - a. Farm Stucture
 - b. Irrigation system
 - c. Drainage system
 - (vii) Processing of crop.
- (D) To develop capacities for decision making and qualities needed for :
- (i) Active & intelligent participation in team work.
 - (ii) Leadership at work & in community as whole.
- (E) To develop entrepreneurship traits
- (i) Decision making innovation.
 - (ii) Calculated risk taking abilities etc.

CURRICULUM AREAS

1. Soil & Water Engineering :
Conserve soil and water by installation of irrigation system.
Drainage, flood and soil erosion system.
2. Farm Power and Machinery :
Equipment including crop processing plant, Machinery maintenance and operation.
3. Farm Structure :
Layouts and supervises construction of farm building and utilities.
4. Rural Electrification and non conventional energy :
Rural electric supply distribution system.
Non conventional energy.
5. Process Engineering :
Processing of farm products.
6. Computer Application :
Uses computer for scheduling, estimating and farm related other activities as well as for farm management.
7. Rural & Entrepreneurship Development :
Prepares project for rural development and starting his own enterprise.

**1.1 FOUNDATIONAL COMMUNICATION
SECTION "A" (ENGLISH)**

L T P
4 - -

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
Section A English				
1.	PARTS OF SPEECH	12	-	-
2.	VOCABULARY BUILDING	05	-	-
3.	Grammar	15	-	-
4.	DEVELOPMENT OF EXPRESSION (Composition)	12	-	-
Section B Hindi				
5.	Topic 5	2	-	-
6.	Topic 6	5	-	-
7.	Topic 7	5	-	-
		56	-	-

DETAILED CONTENTS

1. **PARTS OF SPEECH :**
 - a. Noun
 - b. The pronoun : Kinds and Usage
 - c. The adjective : Kinds and Degree
 - d. Determiner : Articles
 - e. The verb : Kinds
 - f. The Adverb : Kinds, Degree and Usage
 - g. Prepositions
 - h. Conjunctions
 - i. The Interjections
 - j. Subject: Verb Agreement (Concord)
2. **VOCABULARY BUILDING :**
 - a. Antonyms and Synonyms
 - b. Homophones
 - c. One word substitutions
 - d. Idioms and Phrases
 - e. Abbreviations
3. **Grammar**
 - a. Sentence & its types
 - a. Tenses
 - b. Punctuations
 - c. Active and Passive voice
 - d. Transformation of Sentences
 - e. Synthesis of Sentences
 - f. Direct and Indirect Narrations
4. **DEVELOPMENT OF EXPRESSION (Composition) :**

- a. Paragraph Writing
- b. Essay Writing
- c. Proposal Writing
- d. Letter Writing (Formal, Informal, Business, official etc.)
- f. Report Writing
- g. Note Making
- h. News Making
- i. Application Writing
- j. Minute Writing
- k. Invitation Letter Writing

SECTION "B" (Hindi)

- 5- संज्ञा, सर्वनाम, विशेषण, क्रिया विशेषण, वर्ण समास, संधि, अलंकार, रस, उपसर्ग प्रत्यय।
- 6- पत्र लेखन, निविदा संविदा, दर आमंत्रण (कोटेशन) अपील, स्वतन्त्र अभिव्यक्ति, प्रतिवेदन लेखन, प्रेस विज्ञप्ति।
- 7- वाक्य/वाक्यांश के लिए शब्द, पर्यायवाची या समानार्थी शब्द, विलोम शब्द, अनेकार्थी शब्द, शब्दयुग्म या समुच्चारित शब्द समूह, वाक्य शुद्धि (शुद्ध अशुद्ध वाक्य), मुहावरे एवं लोकोक्तियाँ।

1.2 APPLIED MATHEMATICS I (A)
[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time		
		L	T	P
1.	Algebra- I	8	3	-
2.	Algebra- II	8	3	-
3.	Trigonometry	6	2	-
4.	Differential Calculus-I	10	3	-
5.	Differential Calculus-II	10	3	-
-		42	14	-

DETAILED CONTENTS:

1. ALGEBRA-I : (10 Marks)
 - 1.1 Series : AP and GP; Sum, nth term, Mean
 - 1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.
 - 1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Cramer's rule
2. ALGEBRA-II:(10 Marks)
 - 2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.
 - 2.2 Complex number.

Complex numbers, Representation, Modulus and amplitude Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..
3. TRIGONOMETRY :(8 Marks)

- 3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relation ship between sides and angle of a triangle.
- 3.2 Inverse circular functions : Simple case only
- 4. DIFFERENTIAL CALCULUS - I : (12 Marks)
 - 4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.
 - 4.2 Methods of finding derivative, - Function of a function, Logarithmic differentiation, Differentiation of implicit functions.
- 5. DIFFERENTIAL CALCULUS -II :(10 Marks)
 - 5.1 Higher order derivatives, Leibnitz theorem.
 - 5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.
 - 5.3 Application - Finding Tangents, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

1.3 APPLIED PHYSICS-I

[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Units & Dimensions	3	1	-
2.	Errors in Measurement	3	1	-
3.	Circular Motion	4	1	-
4.	Motion of Planets	4	1	-
5.	Dynamics of rigid body (Rotational Motion)	5	1	-
6.	Fluid Mechanics and Friction	4	1	-
7.	Friction	4	1	-
8.	Harmonic Motion	5	2	-
9.	Heat & Thermodynamics	6	4	-
10.	Acoustics	4	1	-
		42	14	-

DETAILED CONTENTS:

1. Units and Dimensions (4 Marks)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to:

- i) Checking the correctness of physical equations,
- ii) Deriving relations among various physical quantities,
- iii) Conversion of numerical values of physical quantities from one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and

systematic errors, estimation of probable errors in the results of measurement (Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

3. Circular Motion (5 Marks)

Central forces. Uniform Circular motion (Horizontal and Vertical cases), angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES : (5 Marks)

Gravitational force, Acceleration due to gravity and its variation w.r. to height and depth from earth, Kepler's Law, Escape and orbital velocity, Time period of satellite, Geo-stationary, Polar satellites (Concept Only)

5. Dynamics of Rigid Body (Rotational Motion) (6 Marks)

Rigid body, Rotational motion, Moment of inertia, Theorems (Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylinderical), Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane. Concept of Fly wheel.

6. Fluid Mechanics : (5 Marks)

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity ($A_1V_1=A_2V_2$), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. Friction : (4 Marks)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. Harmonic Motion (6 Marks)

Periodic Motion, characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system.

Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. Heat & Thermodynamics: (6 Marks)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. Acoustics (5 Marks)

Definition of pitch, loudness, quality and intensity of sound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Acoustics of building defects and remedy.

1.4 APPLIED CHEMISTRY

[Common to All Engineering Courses]

L T P
6 - 4

Rationale:

Engineering Chemistry has profound and deep relationship with the industrial and environmental technology. This curriculum intends to impart technical knowledge alongwith productive practice to the students of the diploma engineering. The teachers are expected to guide the students in the classroom and the laboratories according to the curriculum by demonstrations and by showing relevant materials and equipments to inculcate interests in learning among students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Atomic Structure	4	-	-
2	Chemical Bonding	6	-	-
3.	Classification of Elements	4	-	-
4.	Electro Chemistry-I	7	-	-
5.	Electro Chemistry-II	8	-	-
6.	Chemical Kinetics	4	-	-
7.	Catalysis	4	-	-
8.	Solid State	4	-	-
9.	Fuels	4	-	-
10.	Water Treatment	6	-	-
11.	Colloidal State	4	-	-
12.	Lubricants	4	-	-
13.	Hydrocarbons	7	-	-
14.	Organic Reactions & Mechanism	8	-	-
15	Polymers	4	-	-
16	Synthetic Materials	6	-	-
		84	-	56

DETAILED CONTENTS:

1. ATOMIC STRUCTURE : (3 MARKS)

Basic concept of atomic structure, Matter wave concept, Quantum number, Haiseberg's Uncertainty Principle, Shaples of orbitals.

2. CHEMICAL BONDING : (4 MARKS)

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS : (3 MARKS)

Modern classification of elements (s,p,d and f block elements), Periodic properties : Ionisation potential, electronegativity, Electron affinity.

4. ELECTRO CHEMISTRY-I: (3 MARKS)

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II: (3 MARKS)

Redox reactions, Electrode potential (Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electrochemical series and its application. Chemical and Electrochemical theory of corrosion, Galvanic Series. Prevention of corrosion by various methods.

6. CHEMICAL KINETICS : (3 MARKS)

Law of mass action, order and molecularity of reaction. Activation energy, rate constants, 1st order reactions and 2nd order reactions.

7. CATALYSIS : (2 MARKS)

Definition Characteristics of catalytic reactions, Catalytic promoters and poisons, Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE : (2 MARKS)

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS : (3 MARKS)

Definition, its classification, high & low calorific

value. Determination of calorific value of solid and liquid fuels by Bomb calorimeter.

Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Diesel and Petrol), Benzol and Power alcohol. Knocking, Anti-knocking agents, Octane number and Cetane number.

Cracking and its type, Gasolining from hydrogenation of coal (Bergius process and Fischer tropesch's process)

Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG.

Numerical Problems based on topics

10. WATER TREATMENT : (3 MARKS)

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Soda lime, Zeolite and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, primming and foaming in boilers.

Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorination, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER : (3 MARKS)

Concept of colloidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, Tyndal effect, Electro phoresis and coagulation. relative stability of hydrophilic and hydrophobic colloids. Protection and protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS : (3 MARKS)

Definition, classification, Necessity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compounds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS: (4 MARKS)
- A. Classification and IUPAC nomenclature of organic compounds homologous series (Functional Group)
 - B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.
14. ORGANIC REACTIONS & MECHANISM: (4 MARKS)
1. Fundamental aspects -
 - A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
 - B. Inductive effect, Mesomeric effect, Electromeric effect.
 - 2.A. Mechanism of addition reaction (Markovnikov's Rule, Cyanohydrin and Peroxide effect),
 - B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Craft reaction.
 - C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.
15. POLYMERS : (3 MARKS)
1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)
 2. Thermosetting and Thermoplastic resins -
 - A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.
 - B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.
 3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers (Silicon)
16. SYNTHETIC MATERIALS : (4 MARKS)
- A. Introduction - Fats and Oils
 - B. Saponification of fats and oils, Manufacturing of soap.
 - C. Synthetic detergents, types of detergents and its

- manufacturing.
3. EXPLOSIVES: TNT, RDX, Dynamite.
4. Paint and Varnish

LIST OF PRACTICALS

1. To analyse inorganic mixture for two acid and basic radicals from following radicals
 - A. Basic Radicals :
NH₄⁺, Pb⁺⁺, Cu⁺⁺, Bi⁺⁺⁺, Cd⁺⁺, As⁺⁺⁺, Sb⁺⁺⁺,
Sn⁺⁺, Al⁺⁺⁺, Fe⁺⁺⁺, Cr⁺⁺⁺, Mn⁺⁺, Zn⁺⁺, Co⁺⁺
Ni⁺⁺, Ba⁺⁺, Sr⁺⁺, Ca⁺⁺, Mg⁺⁺
 - B. Acid Radicals :
CO₃⁻⁻, S⁻⁻, SO₃⁻⁻, CH₃COO⁻, NO₂⁻,
NO₃⁻, Cl⁻, Br⁻, I⁻, SO₄⁻⁻
2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.
3. To determine the total hardness of water sample in terms of CaCO₃ by EDTA titration method using Eriochroma black-T indicator.
4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein as indicator.
5. To determine the Chloride content in supplied water sample by using Mohr's methods.
6. Determination of temporary hardness of water sample by O-Henry's method.

1.6 ENGINEERING DRAWING

[Common to Three years Diploma Course in Civil Engg., Electrical Engg., Chemical Engg., Dairy, Ceramic, Textile Technology, Textile Chemistry]

[Also Common to Four year Part-time Diploma Course in Electrical Engineering, Mechanical Engineering (Specilization in Production Engineering)]

[Also common to First year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology]

L T P
4 - 10

Rationale

Drawing, which is known as the language of engineers, is a widely used means of communication among the designers, engineers, technicians, draftmen and craftsmen in the industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. Thus, for the effective and efficient communication among all those involved in an industrial system, it becomes necessary that the perosnnel working in different capacities acquire appropriate skills in the use of this graphic language in varying degrees of proficiency in accordance with their job requirements.

Generally speaking, an engineering technician working at the middle level of the threetier technical manpower spectrum, is required to read and interpret the designs and drawings, providedto him by technologists and subsequently to translate them to the craftsmen for actual execution of the job.

This course in Engineering Drawing has been designed, keeping in view, the above refered job functions of a technician in the industry. This preliminary course aims at building a foundation for the further courses in drawing and other allied subjects. The contents of the course have been selected as to form a core for the various deversified fields of engineering. It is expected that at the end of this session, the students acquires sufficient skill drafting and some ability in spetial visualization of simple objects.

Sl.N.	Units	Coverage Time		
		L	T	P
1.	Drawing Instruents and their use	5	-	4
2.	A. Lettering techniques	3	-	16
	B. Introduction to scales	2	-	8
3.	Conventional Presentation	5	-	8
4.	A. Principles of projections	3	-	12
	B. Point Line, Plane	2	-	28
5.	Orthographic projection of simple geometrical solids	5	-	12

6.	Section of Solids	5	-	20
7.	Isometric Projection	5	-	20
8.	Free Hand Sketching	5	-	8
9.	Development of surfaces	5	-	24
10.	Orthographics Projection of Machine Parts	5	-	12
11.	Practice on Auto Cad	6	-	24
				56 - 140

C O N T E N T S

NOTE : Latest Indian Standards Code of Practice to be followed.

1.	Drawing, instruments and their uses.	1 Sheet
1.1	Introduction to various drawing, instruments.	
1.2	Correct use and care of Instruments.	
1.3	Sizes of drawing sheets and their layouts.	
2. (a)	Lettering Techniques	2 Sheet
	Printing of vertical and inclined, normal single stroke capital letters.	
	Printing of vertical and inclined normal single stroke numbers.	
	Stencils and their use.	
2. (b)	Introduction to Scales	2 Sheet
	Necesssity and use, R F	
	Types of scales used in general engineering drawing. Plane, diagonal and chord scales.	
3.	Conventional Presentaion :	1 Sheet
	Thread (Internal and External), Welded joint, Types of lines, Conventional representation of materials, Conventional representation of machine parts.	
4. (a)	Principles of Projection	1 Sheet
	Orthographic, Pictorial and perspective.	

- Concept of horizontal and vertical planes.
 Difference between I and III angle projections.
 Dimensconing techniques.
- (b) Projections of points, lines and planes. 1 Sheet
- 5 (a) Orthographic Projections of Simple Geometrical Solids 2 Sheet
- Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with referance planes.
- (b) Orthographic views of simple composite solids from their isometric views.
- (c) Exercises on missing surfaces and views
6. Section of Solids 2 Sheet
- Concept of sectioning
- Cases involving cutting plane parallel to one of the reference planes and prependicular to the others.
- Cases involving cutting plane perpendicular to one of the reference planes and inclind to the others plane, true shape of the section
7. Isometric Projection. 2 Sheet
- Isometric scale
- Isometric projection of solids.
8. Free hand sketching 1 Sheet
- Use of squared paper
- Orthographic views of simple solids
- Isometric views of simple job like carpentary joints
9. Development of Surfaces 2 Sheet
- Parallel line and radial line methods of

developments.

Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).

10. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS: 2 Sheet

Nut and Bolt, Locking device, Wall bracket

11. PRACTICE ON AUTO CAD : 2 Sheet

Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

NOTE :

A. The drawing should include dimension with tolerance wherever necessary, material list according to I.S. code. 25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure

B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

1.6 AGRICULTURAL SCIENCE

L T P
6 - 2

RATIONALE:

Agricultural science is a basic subject for a diploma holder in agricultural engineering. This subject a learner has already read in highschool agricultural course. The revision and an advance knowledge of the subject is necessary for studying agricultural technology subjects.

The course contents of this subject has been developed to inculcate the skill of identification of the crops, common weeds, insecticide, fungicide and fertilizer as well as the skill in preparation of seed beds and seed treatment for different seeds and crops.

TOPIC WISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	L	T	P
1.	Introduction			3
2.	Physiological Processes			9
3.	Agronomical Processes			9
4.	Classification of crops			21
5..	Weeds & weed control			9
6.	Cropping schemes & crop rotaion			9
7.	Plant Propagation			12
8.	Mushroom Cultivation			5
9.	Bio-Insecticides			5
10.	Waste Land Development			2
TOTAL				84 - 28

DETAIL CONTENTS

1. Introduction to Crop production related to engineering.
2. Elementary idea of Certain physiological processes, osmosis, photosynthesis, transpiration, evaporation and respiration. Factors affecting these processes.
3. Agronomical Sequences-Monoculture,mixed cropping, multiple cropping, relay cropping;their adoptability advantages and disadvantages.

4. Classification of crops: Detail study of cereals crops (wheat, paddy and maize) legume crops (soyabean, moong and arhar), cash crops (potato, sugarcane), oil seed crops, sunflower (mustard, groundnut) and fruit crops (mango, apple and guava) including their production practices, Elementary exposure pest diseases and their control.
5. Identification of weeds and method of weed control for various crops (crops of item 4), Use of weed as green fertilizer and composite material fabrication.
6. Cropping scheme and crop rotation their importance for different agro climatic condition.
7. Plant Propagation : Seed propagation and vegetative propagation, their merits and demerits.
8. Mushroom Cultivation : Introduction and requirements, Method of cultivation.
9. Preparation of bio-insecticides by the use of Neem leaves, Tobacco, Dhatura and other plants
10. Waste Land Development : Concept and uses.

PRACTICAL

List of experiments to be performed.

1. Identification of crops, vegetable seeds & fertilizers.
2. Identification of common weeds, insecticide, fungicide & weedicide.
3. Seed treatment before sowing the crops.
4. Seed bed preparation of sugarcane, potato, maize, Paddy and wheat.
5. Practice of pruning and some vegetative propagation like cutting, budding and airlayering.
6. Raised bed farming system (Tatura System).

II Semester

2.1 APPLIED MATHEMATICS I (B)
[Common to All Engineering Courses]

L T P
3 2/2 -

Rationale:

The study of mathematics is an important requirement for the understanding and development of any branch of engineering. The purpose of teaching mathematics to diploma engineering students is to impart them basic knowledge of mathematics which is needed for full understanding and study of engineering subjects.

S.N.	Units	Coverage Time		
		L	T	P
1.	Integral Calculus-I	12	4	-
2.	Integral Calculus-II	12	4	-
3.	Coordinate Geometry (2 Dimensional)	10	3	-
4.	Coordinate Geometry (3 Dimensional)	8	3	-
-		42	14	-

DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I : (14 Marks)

Methods of Indefinite Integration :-

- 1.1 Integration by substitution.
 - 1.2 Integration by rational function.
 - 1.3 Integration by partial fraction.
 - 1.4 Integration by parts.
2. INTEGRAL CALCULUS -II :(14 Marks)
- 2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.
 - 2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.
 - 2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule :

their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):(14 Marks)

3.1 CIRCLE :

Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

3.2 Standard form and simple properties

Parabola $x^2=4ay$, $y^2=4ax$,

Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):(8 Marks)

4.1 Straight lines and planes in space -

Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),

4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz=d$ (Radius, Centre and General Equation)

2.2 APPLIED PHYSICS-II

[Common to All Engineering Courses]

L T P
3 2/2 4

Rationale:

Engineering physics is a foundation Course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. While teaching the subject, teachers should make maximum use of demonstrations to make the subject interesting to the students.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	L	T	P
1.	Optics	4	1	-
2.	Introduction To Fiber Optics	4	1	-
3.	Laser & its Application	4	1	-
4.	Electrostatics	4	1	-
5.	D.C. Circuits	4	1	-
6.	Magnetic Materials & Their Properties	4	1	-
7.	Semi Conductor Physics	4	1	-
8.	Introduction Diode & Transistors	4	2	-
9.	Introduction To Digital Electronics	4	2	-
10.	Non-conventional energy sources	6	3	-
Total		42	14	56

1. Optics (4 Marks)

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroids.

2. Introduction To Fibre Optics :(5 Marks)

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications (4 Marks)

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their

applications. Introduction to MASER.

4. Electrostatics : (4 Marks)

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor, Energy of a charged capacitor, Effect of dielectric on capacitors.

5. D.C. Circuits (5 Marks)

Ohm's Law, Kirchoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties: (5 Marks)

Dia, Para and Ferro-magnetism, Ferrites, Magnetic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics (4 Marks)

Concept of Energy bands in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semiconductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transistor : (6 Marks)

Majority and Minority charge carriers, P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor-action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics : (6 Marks)

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources: (7 Marks)

- (a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.
- (b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy:

Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph T^2 versus l and using the formula $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E_1/E_2 of cells by potentiometer.
8. Determination of specific resistance by Carey Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

NOTE :

Students should be asked to plot a graph in experiments (where possible) and graph should be used for calculation of results. Results should be given in significant figures only.

2.3 APPLIED MECHANICS

[Common to three years Diploma Course in Civil Engg., Agriculture, Dairy, Ceramic, Civil & Rural Engg., Chemical Engineering, Architecture Assistantship, Computer Science & Engineering]

[Also Common to Mechanical Engineering (Spacialization In Production Engineering)

[Also common to First year Diploma Course in Chemical Technology : (1) Fertilizer Technology, (2) Rubber and Plastic Technology]

L T P
5 1 2

RATIONALE

The subject Applied Mechanics deals with fundamental concepts of mechanics which are useful for the students for further understanding of the second & final year subjects like S.O.M. and theory and design of steel & masonry structures as well as RCC designs. The subject enhances the method ability of the students.

TOPIC WISE DISTRIBUTION OF PERIODS

SL.No.	Topic	L	T	P
1.	Introduction	4	1	
2.	System of Forces & General Condition of Equilibrium	18	4	
3.	Moment and Couple	8	1	
4.	Friction	8	1	
5.	Machines	8	1	
6.	Center of Gravity	8	2	
7.	Moment of Inertia	8	2	
8.	Beam & Trusses	8	2	
Total		70	14	28

DETAILED CONTENTS

1. Introduction:

Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

2.A. System of Forces :

Concept of coplaner and non-coplaner forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of coplaner concurrent force system.

B. General Condition of Equilibrium:

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

3. Moment & couple:

Concept of Varignon's theorem. Generalised theorem of moments. Application to simple problems on levers-Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple ; Simple applied problems such as pulley and shaft.

4. Friction:

Types of friction:statical,limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

5. Machines:

Definition of a machine. Mechanical advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine Lifting machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle. Simple screw jack, differential screw jack, simple worm and worm wheel.

6. Centre of Gravity:

Concept, definition of centroid of plain figures and center of gravity of symmetrical solid bodies. Determination of

centroid of plain and composite lamina using moment method only, Centroid of bodies with removed portion. Determination of center of 'gravity' of solid bodies - cone, cylinder, hemisphere and sphere, composite bodies and bodies with portion removed.

7. Moment of Inertia:

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical section : rectangle, triangle, circle (without derivations). Second moment of area for L, T, I and channel section, section of modulus.

8. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, Bow's notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members. Analytical methods: method of joints and method of sections. (simple problems only)

Applied Mechanics Lab : Practicals

1. To verify the law of Polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the coefficient of friction between wood, steel, copper and glass.
5. To find the reaction at supports of a simply supported beam carrying point loads only.
6. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss.
(King / Queen post truss)

8. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines:
- (i) Simple wheel & axle
 - (ii) Differential wheel & axle
 - (iii) Differential pulley block
 - (iv) Simple Screw jack
 - (v) Simple Worm & worm wheel
 - (vi) System of Pulleys (any type).
9. To find out center of gravity of regular lamina.
10. To find out center of gravity of irregular lamina.

2.4 MATERIAL & CONSTRUCTION TECHNOLOGY

L T P
6 2 4

RATIONALE

This course aims to equip the technician of agricultural engineering with the knowledge of building materials and construction methods so that they may be able to construct the related structures efficiently and economically as well as can select the materials properly for the desired works.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	TOPIC	L	T	P
(A) MATERIALS				
1.	Non Metallic Materials : Types, characteristics & uses of following building materials (No manufacture).			
	(a) Stones	3	1	
	(b) Bricks	3	1	
	(c) Lime	3		
	(d) Cement	3		
	(e) Timber	3	1	
	(f) Paints and Varnishes	3		
	(g) Hardwares	3	1	
	(h) Plastics	3	1	
2.	Metallic Materials			
	(a) Ferrous Materials	4	1	
	(b) Non Ferrous Materials	4	2	
3.	Misc. Materials	4	1	
(B). CONSTRUCTION METHODS				
	(a) Introduction	3	1	
	(b) Foundation	3	1	
	(c) Stone & Brick Masonry	4	1	
	(d) D.P.C.	3	1	
	(e) Plastering and pointing	3	1	
	(f) Concrete	4	1	
	(g) Floors	3	1	
	(h) Roofing Materials & Trusses (Timber)	3	1	
	(i) Doors & windows	3	1	
	(j) Lintels	3	1	
(C). RURAL CONSTRUCTION				
	(a) Rural buildings	4	2	
	(b) Rural Sanitation	4	2	
	(c) Rural Roads	3	2	
	(d) Rural Drainage	3	2	
	(e) Rural Water Supply	3	1	
TOTAL		84	28	56

DETAILED CONTENTS

(A) MATERIALS

1. Non Metallic Materials

(a) Stone:

Formation of rocks, classification of rocks, quarrying of stones, characteristics and uses of following building stones:

Granite, Sand stone, Lime Stone, Marble & Slate.

(b) Bricks

Characteristics, classification as per IS, special types of bricks - Fire Bricks, surkhi, brick ballast, general idea of tiles.

(c) Lime

Slaking of lime, commercial names, IS classification, characteristics, storage, precautions in handling and uses of lime.

(d) Cement

Natural and artificial cement, characteristics of cement, types of cement, their properties and uses. Method of storage, names of different factories of Northern India.

(e) Timber

Definition, types - hard wood, soft wood, defects of timber seasoning of timber - water seasoning and kiln seasoning, preservation of timber, market forms of timber, brief study of common Indian timbers, ply wood, hard board and batten boards (only properties and uses.)

(f) Paints and Varnishes:

Objects of paints & varnishes, types of paints, characteristics, defects, selection of paints, storage of paints.

Types of varnishes, characteristics and uses of varnishes.

(g) Plastics

Polymers and various composite material, classification, properties, and uses, linoleum, plastic coated paper, polythene sheets, thermocole and PVC.

(2) METALLIC MATERIALS

(a) Ferrous Metals:

Classification of iron.

- i. Cast Iron : Types as per BIS, their properties and uses.
- ii. Classification according to carbon contents and as per BIS, properties of various steel and uses.
- iii. Alloy Steel: Effects of various alloying elements, properties of common steel alloy steel.

(b) Non ferrous Metals:

Basic idea of important ores, properties and uses of following metals:

Alluminium, Zinc, Copper, Tin and Lead.

(3) Miscellaneous:

Properties and uses of following materials:

Asbestos, cork, felt, gattaparcha, mica, adhesives, bakelite, china clay and fibre glass. Leather, Canvas, Jute, rubber and other advance materials

(B) CONSTRUCTION METHODS

- (a) Introduction: Components of a building, section of a wall showing foundation, footing, D.P.C., position of doors and windows, ventilators, lintels, flooring, roofing, and parapet etc. and give general idea of terms related to buildings.
- (b) Foundation: Constructional details of spread footing. (Thumb rules only)
- (c) Brick masonry: Study of various types of brick bonds with special emphasis on English and Flemish bonds, L, T & Cross junctions.
- (d) Damp Proof Course: Materials & Method used.
- (e) Doors and windows: Types and uses of doors, windows and ventilators.
- (f) Plastering and Pointing : Types and Methods.
- (g) Concrete :
 - (i) Lime Concrete - Ingredient, specifications, preparation and uses.
 - (ii) Cement Concrete - Ingredient, preparation, laying, compaction, curing, use of local materials as formwork, application of ferro cement.
- (h) Lintels : Wooden, RCC and RB lintels.
- (i) Floors : Common types, construction methods, drainage and

cleaning of floors.

- (j) Roofs : Roofing materials and timber trusses (sheds for cattle and work places. Bamboo structures and its composite (Such as jute, canvas and bamboo sticks and other agricultural Bi products). Composite roof sheets from agricultural waste Materials.
- (C) Rural Construction:
 - (a) Rural Buildings : Cattle shed, barns, poultry house, grain bin and godowns, their construction details, capacity and functional requirement.
 - (b) Rural Sanitation : Constructional details of septic tank, soak pit, aqua privy and PRAI latrines.
 - (c) Farm Road : Kachcha Road, Tar Macadam and Pakka Road.
 - (d) Rural Drainage : Specification as per BIS standards.
 - (e) Rural Water Supply : Construction and working of India Mark -II pump, Over head tank and laying of pipe lines.
 - (f) Appropriate technology for low cost building construction by locally available materials

PRACTICAL WORK

1. Identification of different types of stones .
2. Identification of different types of timber.
3. To conduct field test of cement.
4. To determine normal consistancy of cement.
5. To determine setting time of cement.(a) Initial setting time (b) Final setting time.
6. To determine water absorbtion of bricks.
7. To determine compressive strength of brick.
8. To determine fineness of cement by sieve method.
9. To make brick bonds (English and Flemish bonds only)
10. To visit construction sites and write specific report about following activities:Earth work in foundation, flooring, plastering, pointing, white washing and colour washing and installation of India Mark-II pump and Laying of water pipe line.

11. Make a roof sheet at polytechnic agricultural waste material, Cement, coarse sand mixture.

2.5 WORKSHOP PRACTICE

[Common with Civil Engg., Civil Engg. (sp. in Rural Engg.), Electrical, Ceramic, Dairy, Agriculture, Chemical Technology (Rubber & Plastic), Chemical Technology (fertilizer), Four year chemical Engg.]

[Four year Past time Mechanical Engg. (sp. in Production Engg.)]

L T P
- - 14

Rationale

A diploma holder in any branch of engineering has to work in between a skilled workman and an Engineer. In order to have effective control over skilled workmen it is necessary that the supervisory staff must have adequate knowledge and skill. For development of skills workshop practice is very essential.

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Carpentry shop	-	-	20
2.	Painting & polishing shop	-	-	16
3.	Sheet metal and soldering shop	-	-	56
4.	Fitting shop, Plumbing & Fastening Shop	-	-	24
5.	Foundry shop			20
6.	Smithy shop	-	-	24
7.	Welding shop	-	-	20
8.	Machine shop	-	-	16
		-	-	196

DETAILED CONTENTS

1. **Carpentry Shop :**
 - EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood
 - EX-2 Planing and sawing practice
 - EX-3 Making of lap joint
 - EX-4 Making of mortise and tenon joint
 - Ex-5 Making of any one utility article such as wooden-picture frame, hanger, peg, name plate, etc.
2. **Painting and Polishing Shop:**
 - EX-1 Introduction of paints, varnishes, Reason for surface

- preparation, Advantage of painting, other method of surface coating i.e. electroplating etc.
- EX-2 To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.
- Ex-3 To prepare metal surface for painting, apply primer and paint the same.
- EX-4 To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

* The sequence of polishing will be as below:

- i) Abrasive cutting by leather wheel.
- ii) Polishing with hard cotton wheel and with polishing material.
- iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

- EX-1 Introduction and Types of sheets, measuring of sheets
- EX-2 Study and sketch of various types of stakes/anvil.
- EX-3 Introduction & demonstration of tools used in Sheet metal working shop.
- EX-4 Cutting, shearing and bending of sheet.
- EX-5 To prepare a soap case by the metal sheet.
- EX-6 To make a funnel with thin sheet and to solder the seam of the same.
- EX-7 To make a cylinder and to solder the same.
- EX-8 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.
- EX-9 To braze small tube/conduit joints.

4. Fitting Shop, Plumbing Shop & Fastening Shop:

- EX-1 Study of materials, limits, fits and tolerances.
- EX-2 Introduction & demonstration of tools used in Fitting Shop.
- EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.
- EX-4 Making bolt & nut by tap and die set and make its joints
- Ex-5 To drill a hole in M.S. Plate and tapping the same to create threads as per need.
- EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.
- EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.
- EX-8 Study of-bib cock, cistern or stop cock, wheel valve

- and gate valve etc.
- EX-9 Practice of bolted joints
 - EX-10 To prepare a rivetted joint
 - EX-11 To make a pipe joint
 - EX-12 To make a threaded joint
 - EX-13 Practice of sleeve joint
5. Foundry Work
- Ex-1 Study of metal and non metals
 - Ex-2 Study & sketch of the foundry tools.
 - Ex-3 Study & sketch of cupola & pit furnace.
 - Ex-4 To prepare the green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)
 - Ex-5 Casting of non ferrous (lead or aluminium) as per exercise 3.
6. Smithy Shop :
- EX-1 Study & Sketch of Tools used in smithy shop.
 - EX-2 To prepare square or rectangular piece by the M.S. rod.
 - EX-3 To make a ring with hook for wooden doors.
 - EX-4 Utility article-to preapre a ceiling fan hook.
7. Welding Shop :
- EX-1 Introduction to welding, classinfication of welding, types of weld joints.
 - EX-2 Welding practice-gas and electric.
 - EX-3 Welding for lap joint after preparing the edge.
 - EX-4 Welding of Butt joint after preparation of the edge.
 - EX-5 'T' joint welding after preparation of edge.
 - EX-6 Spot welding, by spot welding machine.
8. Machine Shop
- EX-1 Study & sketch of lathe machine.
 - EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines
 - Ex-2 Plain and step turning & knurling practice.
 - Ex-3 Study and sketch of planning/Shaping machine and to plane a Ractangle of cast iron.

3.1 HYDRAULICS

(Common to three year Diploma course in Civil Engg., spl.in Rural Engg., Environmental Pollution & Control and Water & Power Resource Management.,)

L T P
5 2 3

RATIONALE

Hydraulics is a subject which helps in solving problems in the subject of Public health Engg./ Environmental Engg. and irrigation engineering. Principles of Hydraulics finds its application in Bridge Engg. and in many other Civil Engg. fields. The subject deals with basic concepts and principles in hydrostatics, hydrokinematics and hydrodynamics and their application, in solving fluid flow problems.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Periods		
		L	T	P
1.	Introduction	1	-	
2.	Properties of Fluids	6	2	
3.	Hydrostatic Pressure	6	4	
4.	Measurement of pressure	6	2	
5.	Fundamentals of fluid flow	6	3	
6.	Orifices	6	2	
7.	Flow through pipes	9	3	
8.	Flow through open channels	9	3	
9.	Flow measurement	9	4	
10.	Hydraulic Machine	12	5	
Total		70	28	42

1. Introduction:
 - 1.1 Fluid : Real fluid, ideal fluid.
 - 1.2 Fluid Mechanics, Hydraulics, Hydrostatics, Hydrokinematics and Hydrodynamics.
2. Properties of Fluids
 - 2.1 Mass density, specific weight, specific gravity,

cohesion, adhesion, viscosity, surface tension, capillarity, vapour pressure and compressibility.

3. Hydrostatic Pressure:

3.1 Pressure, intensity of pressure, pressure head, Pascal's law and its applications.

3.2 Total pressure, resultant pressure, and centre of pressure.

3.3 Total pressure and centre of pressure on vertical and

inclined plane surfaces:

3.3.1 Rectangular

3.3.2 Triangular

3.3.3 Trapezoidal

3.3.4 Circular

4. Measurement of Pressure

4.1 Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.

4.2 Piezometers, simple manometer, differential manometer and mechanical gauges. Measurement of pressure by manometers and pressure gauges.

5. Fundamental of Fluid Flow

5.1 Types of Flow:

5.1.1 Steady and unsteady flow

5.1.2 Laminar and turbulent flow

5.1.3 Uniform and non-uniform flow.

5.2 Discharge and continuity equation (flow equation)

5.3 Types of hydraulic energy.

5.3.1 Potential energy

5.3.2 Kinetic energy

5.3.3 Pressure energy

5.4 Bernoulli's theorem; statement and description (without proof of theorems).

5.5 Venturimeter (horizontal and inclined) and Orifice Plate meter.

6. Orifice:

6.1 Definition of Orifice, and types of Orifices,

- 6.2 Hydraulic Coefficients.
 - 6.3 Large vertical orifices.
 - 6.4 Free, drowned and partially drowned orifice.
 - 6.5 Time of emptying a rectangular/circular tanks with flat bottom.
- 7. Flow through Pipes
 - 7.1 Definition, laminar and turbulent flow explained through Reynold's Experiment.
 - 7.2 Reynolds Number, critical velocity and velocity distribution.
 - 7.3 Head Losses in pipe lines due to friction, sudden expansion and sudden contraction entrance, exit, obstruction and change of direction (No derivation of formula)
 - 7.4 Hydraulic gradient line and total energy line.
 - 7.5 Flow from one reservoir to another through long pipe of uniform and composite section.
 - 7.6 Water Hammer Phenomenon and its effects. (only elementary treatment)
 - 8. Flow through open channels.
 - 8.1 Definition of a channel, uniform flow and open channel flow .
 - 8.2 Discharge through channels using
 - (i) Chezy's formula (no derivation)
 - (ii) Manning's formula
 - 8.3 Most economical sections
 - (i) Rectangular
 - (ii) Trapezoidal
 - 9. Flow Measurements
 - 9.1 Measurement of velocity by
 - (i) Pitot tube
 - (ii) Current-meter
 - (iii) Surface Float
 - (iv) Velocity rods.
 - 9.2 Measurement of Discharge by a Notch
 - 9.2.1 Difference between notches and orifices.

9.2.2 Discharge formulae for rectangular notch, triangular Notch, trapezoidal notch, and conditions for their use. (with derivation)

9.3 Measurement of discharge by weirs.

9.3.1 Difference between notch, weir and barrage.

9.3.2 Discharge formula for free, drowned, and broad crested weir with and without end contractions ; velocity of approach and condition of their use.

9.3.3 Venturi flumes to measure flow.

9.4 Measurement of Discharge by velocity area-method.

10. HYDRAULIC MACHINE :

10.1 Reciprocating pumps

10.2 Centrifugal pumps

10.3 Submercible Pump

10.4 Impulse Turbines

10.5 Reaction Turbines

Sketching and description of principles of working of above mentioned machines

LABORATORY WORK

- (i) To verify Bernoullis Theorem.
- (ii) To find out venturimeter coefficient.
- (iii) To determine coef. of velocity (C_v), Coef. of discharge (C_d) Coef. of contraction (C_c) and verify the relation between them.
- (iv) To perform Reynold's Experiment.
- (v) To determine Darcy's coefficient of friction for flow through pipes.

- (vi) To verify loss of head due to:
 - (a) Sudden enlargement
 - (b) Sudden Contraction.
- (viii) To determine velocity of flow of an open channel by using a current meter.
- (ix) To determine coefficient of discharge of a rectangular notch/triangular notch.
- (x) Study of the following
 - (i) Reciprocating Pumps or Centrifugal Pumps.
 - (ii) Impulse turbine or Reaction turbine
 - (iii) Pressure Gauge/water meter/mechanical flow meter/pitot tube.

3.2 SOIL SCIENCE & SOIL MECHANICS

L T P
5 - 4

RATIONALE

A diploma holder in agricultural engg. has to work with various types of soils in the field. This subject is aimed to equip the students with the capability of identifying various types of soils, their properties and behaviour in the field conditions.

In addition to above the knowledge of soil mechanics is also necessary in connection with the construction of rural roads, farm structures, storage bins and embankment or filling of earth while leveling the land.

The curriculum of this subject has been developed to cater the above mentioned needs.

TOPIC WISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	LECT.
A. Soil Science		
1.	Origin and classification of soils.	4
2.	Physical properties of soils	4
3.	Chemistry of soils	4
4.	Introduction to Bio-Fertilizer	5
B. Soil Mechanics		
5.	Introduction: Natural, residual and transported soils weight volume relationship, determination of unit weights of soil, water contents and void ratio.	9
6.	Engineering properties of soils: Consistency of soil-Atterberg's limits. Permeability of soil, compaction of soil. Shear strength of soil, bearing capacity of soil.	10
7.	Sub Surface exploration & investigation of soil..	8
8.	Earth Pressure	10
9.	Shallow and Deep Foundations	10
10.	Stabilization of Soils by Lime & Cement	6
TOTAL		70 56

DETAILED CONTENTS

A. SOIL SCIENCE

1. Origin and classification of soils : Origin of soils, weathering of rocks and formation of horizon, composition of soils, structure of soils, classification of soils (based on agricultural needs), IS classification of soil, triangular classification of soil. Distinction between clay, loam & silt.
2. Physical properties of soil: Texture, particle density, structure, bulk density, porosity, air & water in soil, temperature, consistency and organic matter.
3. Chemistry of soils: Soil-water plant relation, soil mineral and chemical classification. (Acid soil, calcareous soil and saline soil) elementary exposure. Method of reclamation of acid & alkaline soil.
4. Introduction to Bio-Fertilizers, its importance.

B. SOIL MECHANICS

5. Introduction : Natural, residual and transported soil. weight volume relationship, determination of soil unit weights, water content and void ratio. Structure of soil : granular and cohesive soil. Soil colloids and Brownian motion.
6. Grain Size distribution: Sieve analysis, Stokes' law, hydrometer analysis (basic concept only), grain size accumulation curves their plotting and interpretation, IS soil classification.
7. Engineering properties of soil:
 - a. Consistency of soil: Atterberg's limits, method of determination of liquid limit and plastic limit, plasticity index, plotting of flow curve on semilog graph.
 - b. Permeability of soil: Darcy's law, coefficient of permeability, parameters affecting permeability, determination of permeability by constant and variable head permeameters, quick sand condition, seepage through soils.
 - c. Compaction and consolidation of soil: Concept of compaction and consolidation, difference between them, optimum moisture content, dry density, Proctor compaction test, use of optimum moisture content in embankment,
 - d. Shear strength of soil : Definition of shear strength, Coulomb's law, direct shear box test and shear vane test.
 - e. Bearing capacity of soil : Definition, net, ultimate and safe bearing capacity, plate load test.
 - f. Subsurface investigation : Preliminary exploration, test pit, different methods of boring, augers, methods of sampling, sealing of samples, disturbed, representative and undisturbed samples, split spoon sampler.
8. Earth Pressure and Retaining Structures

- 8.1 Definition of earth pressure, active and passive earth pressures, terms and symbols relating to a retaining wall.
- 8.2 Relation between movement of wall and earth pressure
- 8.3 K_a and K_b by Rankin's Method.
- 9. Shallow and Deep Foundations
 - 9.1 Definitions of shallow and deep foundations
 - 9.2 Types of shallow and deep foundations
 - 9.3 Application of Terzaghi's bearing capacity formulae for different types of foundations.
- 10. Stabilization of Soils by Lime & Cement
 - Concept of stabilization, materials used, advantages of lime & cement as stabilizing agents. Strength of stabilized soil.

PRACTICE

LIST OF EXPERIMENTS:

- A. SOIL SCIENCE :
 - 1. Determination of moisture tension with Tensionmeter.
 - 2. Determination of wilting point.
 - 3. pH value determination.
 - 4. Classification of soil and field identification test.
- B. SOIL MECHANICS:
 - 5. Determination of grain size distribution by sieve analysis.
 - 6. Determination of liquid limit and plastic limit.
 - 7. Determination of permeability by constant and variable head permeameter.
 - 8. Determination of shear strength by direct shear box test.
 - 9. Determination of OMC by Procter compaction test.
 - 10. Determination of field density by core cutter method and sand replacement method

3.3 SURVEYING AND LEVELLING

L T P
3 - 8

RATIONALE

The course aims to enable the students to do land and water survey, prepare maps/plans for (i) Simple Irrigation works like laying of pipe lines and drainage channels, (ii) Road alignment. It also enable them to carry out field levelling and make contour maps of the farms and forest etc.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	TOPICS	LECT.	PDS.
1.	Introduction	2	
2.	Measurement of distances	2	
3.	Chain Survey	6	
4.	Measurement of areas	2	
5.	Compass Survey	4	
6.	Levelling	6	
7.	Plane Table Survey	6	
8.	Contouring	6	
9.	Theodolite.	6	
10.	Minor Instruments	2	
TOTAL		42	112

DETAILED CONTENTS

1. INTRODUCTION:

Definition of Surveying and levelling, purpose, linear and angular units of measurement, instruments used for taking these measurements. Basic principle of Surveying, classification of survey.

2. MEASUREMENT OF DISTANCES:

Instruments used, types of chain, chaining of a line, ranging, line ranger, reciprocal ranging, setting out a right angle, optical square, cross staff, offset- right and oblique, errors in chaining, types of errors, correction of length measured by a faulty chain, chaining on sloping ground.

3. CHAIN SURVEY:

Definition of terms -Survey station, base line, tie line, check line, running measurement, reference sketch etc. Triangulation of an area, well conditioned triangle, method of booking a survey line, plotting of a survey line, symbols and conventional signs, permissible errors. Obstacles in chain survey.

4. MEASUREMENT OF AREA:

Direct measurement of area on paper by planimeter, Simpson's rule, average ordinate rule, trapezoidal rule, enlargement and reduction of a plan, pentagraph and edigraph.

5. COMPASS SURVEY:

Purpose, concept of meridians- magnetic, true and arbitrary. Bearing of a line, types of bearing, systems of bearing, fore bearing and back bearing, dip and declination, conversion of bearing from one system to other, calculation of included angles from bearings, calculation of bearings when included angles and bearing of some line is given, local attraction, causes, detection and correction of local attraction, construction, principle and working of prismatic and surveyor's compass. Traversing by compass, closed and open traverse, plotting of a traverse- included angle method and deflection angle method.

6. LEVELLING:

Definition of terms, levelling, level and horizontal surfaces. Datum-standard and ordinary, reduced level, bench mark, types of bench marks. Methods of levelling, direct and indirect levelling, their scope and utility. Direct levelling -simple, compound and reciprocal levelling, levelling instruments, hand level, clinometer, levelling staves, merit and demerits of different types of staves and their use. Levelling field book. Fly levelling and check levelling. Differential levelling and its precision. Profile levelling, longitudinal levelling, cross sectional levelling, plotting of profile. Method of drawing longitudinal and cross section of a channel, drainage and road.

7. PLANE TABLE SURVEY :

Plane table and its accessories, adjustments of a plane table, centering, levelling and orientation. Methods of plane tabling- radiation, intersection, traversing and resection. Errors in plane table survey, advantages and disadvantages of plane table survey.

8. THEODOLITE :

Types of theodolite, different parts of a transit theodolite, different axes of a theodolite, relation between them, temporary adjustment of a theodolite, elementary knowledge of reading bearing by a theodolite.

9. CONTOURING:

Definition of contour line, grade contour, horizontal equivalent, vertical interval. Contours of a hill, pond, valley, ridge, vertical cliff, valley line, ridge or water shed line. Method of drawing contours- direct and indirect method of contouring.

10. MINOR INSTRUMENTS:

Abney's level, Cylone ghat tracer, Tangent Clinometer.

PRACTICAL

List of survey practicals:

1. To find out distance between two unapproachable objects.
2. Plan of a small area by means of chain surveying.
3. Plan of a small area by means of compass surveying.
4. Plan of a small area by means of plane table survey.
5. Contour map of an area with atleast 3 meter up and down area.
6. Plan for land aquisition and checking it with sajra plan.
7. To plot the longitudinal section of a canal showing the ground level for atleast 1 km length.
8. To determine the elevation difference between two points by levelling with atleast five shifting of instruments.
9. To find out bearing with the help of theodolite
10. Use of minor instruments.
11. Calculation of area of a map with the help of planimeter.

3.4 INTRODUCTION TO COMPUTER

[Common with Civil Engg., Civil (Spl. With Rural), Mechanical Engg., (Specialisation in Production, Automobile, Refrigeration and Air conditioning), Electronics Engg., Instrumentation and Control Engg., Dairy Engg., Leather Technology, Footwear and Leather Goods Tech., Cermics, Chemical Engg. (Four year Sandwich), Chemical Tech. (Rubber & Plastic), Chemical Tech. (Fertilizer)]

L T P
2 - 5

Rationale:

Computers are being used for design and information processing in all branches of engineering. An exposure to fundamentals of computer programming is very essential for all diploma holders. this subject has been included to introduce students in the use and application of computers in engineering.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction to Computer	4	-	-
2.	Introduction To Operating System (MS DOS/Windows)	3	-	-
3.	Word Processing	4	-	-
4.	Worksheet	4	-	-
5.	Presentation	4	-	-
6.	Data Base Operation	3	-	-
7.	Introduction to Internet	2	-	-
8.	Introduction to advance tools	4	-	-
		28	-	70

DETAILED CONTENTS

1. Introduction to Computer:
 - A. Block Diagram of Computer.
 - B. Types Of Computer
 - C. Types of Input and Output devices
 - D. Memories Devices (Its Types and Basic).
2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:)

What is operating system, its significance, Commands of DOS, Features/Application of window.

3. WORD PROCESSING:

File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup
Edit : Cut, Copy, Paste, Office Clipboard, Select All, Find, replace, Goto, etc.
View : Normal/Web Layout/Print Layout; Tool Bars; Header/Footer; Zoom, etc.
Insert: Break, Page Number, Date & Time, Symbol, Comment, Reference, etc.
Format: Font, Paragraph, Bullets & Numbering, Borders & Shading, Column, Change case, Back ground, etc.
Tools : Spelling & Grammer, Language, Word Count, Letters & Mailing, Options, Customize, etc.
Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc.
Mail Merge

4. WORKSHEET:

Introduction, Use of Tools/Icons for preparing simple Mini Project.

5. PRESENTATION :

Introduction, Use of Tools/Icons for preparing simple presentation on Power Point.

6. DATABASE OPERATION :

Create database using MS Access, Create Table and Creating Reports.

7. Introduction to Internet:

What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails.

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.

A. Flow Chart

B. Algoithm

C. Programming

II. Use of advance Tools such as Skype, Teamviewer, Installation of Modem, use of WiFi, Etc.

INTRODUCTION TO COMPUTER LAB

List Of Practicals

1. Practice on utility commands in DOS.
2. Composing, Correcting, Formatting and Article (Letter/Essay/Report) on Word Processing tool Word and taking its print out.
3. Creating, editing, modifying tables in Database tool.
4. Creating labels, report, generation of simple forms in Database tool.
5. Creating simple spread sheet, using in built functions in Worksheet tool..
6. Creating simple presentation.
7. Creating mail ID, Checking mail box, sending/replying e-mails.
8. Surfing web sites, using search engines.

Note : In the final year, related students have to use the concept of MS Word/MS Excel/MS Access/ MS Power Point in their respective branch's project work such as creating project report through MS Word/Creation of statistical data in MS Excel/Creation of database in MS Excel/Demonstration of project through Power Point Presentation.

3.5 AGRICULTURAL EQUIPMENT WORKSHOP PRACTICE

L T P
- - 8

(Atleast 9 jobs are to be made)

I.Machine Shop:

1. Lathe Machine:

- (a) Step turning, Taper turning and knurling. 1 job
- (b) Drilling, boring, counter boring and internal turning 1 job
- (c) V thread cutting (internal and external) 1 job
- (d) Multi-thread cutting 1 job

2. Planer Shaper and Slotter 1 job

3. Group Work on Milling Machine involving down and climb milling:

- (i) Slab milling 1 job
- (ii) Gear cutting 1 job

II.Fitting Shop:

- (i) To make different keys 2 jobs
- (ii) To make Limit gauge 2 jobs
- (iii) To make cup and cut tool 1 job

(iv) To grind a drill 1 job

III. Welding Shop:

(a) Welding practice on mild steel & Cast Iron 2 jobs

(b) Practice of gas cutting 1 job

(c) Practice on spot welding machine 1 job

4.1 Functional Communication

L	T	P
4	-	-

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
Section A English				
1.	On Communication	04	-	-
2.	Exploring Space	04	-	-
3.	Sir C.V. Raman	04	-	-
4.	Professional Development	04	-	-
5.	Buying a Second Hand Bicycle	04	-	-
6.	Leadership and Supervision	04	-	-
7.	First Aid	03	-	-
8.	The Romanance of Reading	03	-	-
9.	No Escape from Computers	03	-	-
10.	Bureau of Indian Standards	03	-	-
Section B Hindi				
1.	Topic 1	02	-	-
2.	Topic 2	02	-	-
3.	Topic 3	02	-	-
4.	Topic 4	02	-	-
5.	Topic 5	02	-	-
6.	Topic 6	02	-	-
7.	Topic 7	02	-	-
8.	Topic 8	01	-	-
9.	Topic 9	02	-	-
10.	Topic 10	02	-	-
11.	Topic 11	01	-	-
		56	-	-

Section "A" (English)

Text Lessons

Unit I.	On Communication
Unit.II	Exploring Space
Unit.III	Sir C.V. Raman
Unit.IV	Professional Development of Technicians
Unit.V	Buying a Second Hand Bicycle
Unit.VI	Leadership and Supervision
Unit.VII	First Aid
Unit.VIII	The Romanance of Reading

Unit.IX No Escape from Computers
Unit.X Bureau of Indian Standards

Section "B" Hindi

- 1- स्वरोजगार
- 2- भारतीय वैज्ञानिकों एवं तकनीकियों का भारत के विकास में योगदान
- 3- ग्राम्य विकास
- 4- परिवार नियोजन
- 5- सामाजिक संस्थायें
- 6- नियोजन और जन कल्याण
- 7- भारत में प्रौद्योगिकी के विकास का इतिहास
- 8- हरित क्रान्ति
- 9- पर्यावरण एवं मानव प्रदूषण
- 10- श्रमिक कल्याण
- 11- भारत में श्रमिक आन्दोलन

4.2 MECHANICS OF SOLIDS

L T P
4 2 3

Rationale :

The subject gives the sight for selection of materials for engineering use and helps in deciding dimensions of the components in design work.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Stress, Strain & Properties of Materials	6	4	-
2.	Complex Stresses	6	4	-
3.	Shear Force & Bending Moment	6	4	-
4.	Theory of Simple Bending	9	4	-
5.	Strain Energy	9	3	-
6.	Torsion	9	4	-
7.	Deflection of Beam	5	2	-
8.	Columns & Struts	6	3	-
-		56	28	42

DETAILED CONTENTS

NOTE:

The treatment of subject is limited to simple numerical problems. This subject previously known as "Strength of Materials" has been renamed as "Mechanics of Solids" .

1. STRESS STRAIN AND PROPERTIES OF MATERIALS:

Mechanical properties of materials Ductility, Tenacity, Brittleness, Toughness, Hardness, Factor of safety. Different types of loads and stresses, strain in a stepped bar. Determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only, stresses in compound bars and columns. Equivalent modulus of a compound bar, temperature stresses. Shrinkage of a tyre on a wheel. Temperature stress in compound bar, stress-strain

curves for mild steel, Aluminium, cast iron & rubber.

2. COMPLEX STRESSES:

Stresses on an oblique plane in a body subjected to direct load, concept of compound stresses. Principal stress and Principal planes under direct and shear stresses. Graphical determination by Mohr's circle.

3. SHEAR FORCE AND BENDING MOMENT:

Shear force and bending moment for concentrated and uniformly distributed loads on simply supported beams, cantilever and overhanging beam. Shear force and bending moment diagrams. Relationship between shear force and bending moment. Point of contra flexure, calculations for finding the position of contra flexure. Condition for maximum bending moment.

4. THEORY OF SIMPLE BENDING:

Simple bending, examples of components subjected to bending such as beam, axle, carriage spring etc.. Assumptions made in the theory of simple bending in the derivation of bending formula. Section Modulus Definition of neutral surface and neutral axis and calculation of bending stresses at different layers from the neutral surface for beam of different sections, Pure bending.

5. STRAIN ENERGY:

Meaning of strain energy and resilience. Derivation of formula for resilience of a uniform bar in tension. Proof resilience, modulus of resilience, suddenly applied load, Impact or shock load. Strain energy in a material subjected to uniaxial tension and uniform shear stress. General expression for total strain energy of simple beam subjected to simple bending.

6. TORSION:

Strength of solid and hollow circular shafts. Derivation of torsion equation. Polar modulus of section. Advantages of a hollow shafts over solid shaft. Comparison of weights of solid and hollow shafts for same strength. Horse power transmitted. Calculation of shaft diameter for a given horse power.

7. DEFLECTION:

Deflection of simple cases of cantilever and simply supported beams with concentrated and uniformly distributed

loads (standard elementary cases only with no proof of formulae) conditions for circular bending.

8. COLUMNS AND STRUTS:

Definition of long column, short column and slenderness ratio. Equivalent length, Critical load, Collapsing load, End conditions of columns. Application of Euler's and Rankine's formulae (No Derivation). Simple numerical problems.

MECHANICS OF SOLID LAB

1. To find the shear force at a given section of simply supported beam for different loading.
2. To find the value of 'E' for a steel beam by method of deflection for different loads.
3. To determine the Max-Fibre stress in X-section of simply supported beam with concentrated loads and to find the neutral axis of the section.
4. To determine the ultimate tensile strength, its modulus of Elasticity, Stress at yield point, % Elongation and contraction in x-sectional area of a specimen by U.T.M. through necking phenomenon.
5. To determine the ultimate crushing strength of materials like steel and copper and compare their strength.
6. To determine Rock Well Hardness No. Brinell Hardness No. of a sample.
7. To estimate the Shock Resistance of different qualities of materials by Izod's test and Charpy test.

8. To determine the bending moment at a given section of a simply supported beam for different loading.
9. To determine the various parameters of Helical coil spring
10. To determine the angle of twist for a given torque by Torsion apparatus and to plot a graph between torque and angle of twist.
11. Study of diamond polishing apparatus.
12. Study metallurgical microscope.
13. (a) To prepare specimens for microscope examination (For Polishing and etching).
 (b) To examine the microstructure of the above specimens under metallurgical microscope.
 (c) To know composition of alloy steel by spectrometer
 (d) To know carbon in steel by carbon steel estimation apparatus
14. Preparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope.
 - i. Brass.
 - ii. Bronze.
 - iii. Grey Cast Iron.
 - iv. Malleable Cast Iron.
 - v. Low Carbon Steel.
 - vi. High Carbon Steel.
 - vii. High Speed Steel.
 - viii. Bearing Steel.
15. To perform heat treatment process on materials of known carbon percentage -
 1. Annealing
 2. Normalising
 3. Case Hardening
16. Mini Project
 - i. Collect samples of heat insulating materials
 - ii. Collect samples of various steels and cast iron.
 - iii. Collect sample of Non-Ferrous alloys.
 - iv. Collect samples of Non-Metallic engineering materials

4.3 FARM POWER ENGINEERING & NON CONVENTIONAL SOURCES OF ENERGY

L T P
6 - 3

Rationale:

Diploma holders in agricultural Engineering should have the knowledge of different sources of power available at farms for driving the farm machinery and equipment. I.C. Engines are the primary sources of power available on farms. Some times these conventional sources are not available adequately in rural areas. Therefore it becomes necessary to harness power from non conventional energy sources such as wind, solar and biogas etc.

The aim of introducing this subject is to equip them with the knowledge of both conventional and non-conventional sources of power. The contents of this subject have been developed to cater above mentioned needs.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	TOPIC	Lecture periods
1.	Introduction	1
2.	I.C.Engines	
	(a)Principle	12
	(b)Engine System	18
3.	Tractors	15
4.	Hourly operation cost	9
5.	Non conventional sources of energy	
	(a)Bio gas technology	9
	(b)Wind energy technology	12
	(c)Solar energy technology	9
	TOTAL	84 42

DETAIL CONTENTS

1. INTRODUCTION:

Sources of power on farms, comparative study and uses, limitation and brief description of animal, fossil fuel (Diesel/petrol) wind, solar, Biogas and electrical power.

2. I.C. ENGINES

(a) Principle : Heat engine, principle of operation, classification of I.C. engines, principles of operation two stroke and four stroke cycle Engine. Difference between two

stroke and four stroke engine. Diesel and petrol engine, stationary, reciprocating and rotary parts, their material of construction and functions. Concept of terms related with I.C. engine. Numerical problems related with different terms. Performance of engine.

(b) Engine System :

- (i) Valve system-Arrangement of valve, Functions of different parts-Valve timing. Effect of incorrect valve timing. Valve clearance and their adjustment. Firing order. Scavenging systems. Ratio and efficiency.
- (ii) Fuel supply systems-System of petrol and diesel engines. Properties of fuel. Fuel filter. Carburetion. Function of Carburettor. Construction and working of simple, compensating and Zenith carburettor. Adjustments in carburettor. Specific fuel consumption.
- (iii) Fuel Injection-Method of injection, construction and working of fuel injection pump, injector atomiser, types of nozzles.
- (iv) Air Cleaner - Importance of clean air in engine. Characteristics of air cleaner. Types of air cleaners, their construction and working. Maintenance of air cleaner.
- (v) Ignition system - Ignition methods. Electric spark ignition, Battery & Magnetic ignition system. Spark plug, combustion in I.C. engine, combustion chamber. Silencer.
- (vi) Governing system - Governing, hit & miss system. Throttle system. Centrifugal & pneumatic governor. Governor hunting and governor regulations.
- (vii) Lubricating system - Importance. Function & quality of lubricant. Types of lubricant used in engine. Sources of lubricant. Selection of lubricant. Splash system. Internal forced feed and splash system, full internal forced feed system. Oil filter.
- (viii) Cooling System - Importance. methods of cooling - Air cooling, water cooling. Thermo siphon and forced circulating system. Thermostate valve. Antifreeze mixture. Pressure Cooling.

3. TRACTOR :

- (a) Introduction. Classification of tractor and adoptability. Factors affecting selection of Tractor. General idea about different makes, models, in

different H.P. ranges of tractors.

- (b) Tractor Clutches-Necessity, properties of clutch, types of clutches, construction and working of single, dual and multi plate disc clutches, power transmission by single plate clutch, clutch troubles.
- (c) Transmission System-Purpose, gear ratio, types of transmission-Selective gear type and constant mesh type. Differential gear type - construction and working. Final drives, power take-off. Belt-pulleys.
- (d) Steering system of wheel tractor.
- (e) Tractor brake mechanism.
- (f) Hydraulic system of tractor-construction and working.
- (g) Hitching system-Drawbar. Principle of hitching, vertical and horizontal hitching adjustments.

4. HOURLY COST OF OPERATION

Hourly cost of operation of small petrol engine, diesel engine and tractor.

5. NON-CONVENTIONAL ENERGY :

(a) Bio-Gas Technology

Introduction to Bio-gas, production to Bio-gas, Bio-digestion of plants and animals waste, reaction taking place during bio-digestion, gases produced during the process, elimination of unwanted gases such as CO_2 and H_2S , factors affecting production of gas, efficiency of Bio-gas plants in winter, uses of biogas, use of digested sludge.

Bio-gas Plant

Construction & working: Main parts of gas plant-digester, gas holder, pressure gauge, gas main controlling cocks and gas meter, dimensional details of plant, working of gas plant.

Bio-gas application and appliances.

(b) WIND ENERGY TECHNOLOGY:

Types of Wind Mills-vertical axis and horizontal axis. Various uses of wind mills-lifting water for drinking and irrigation, corn grinding, sewage

pumping,electrical power generation. Site selection for a wind mill. Construction of wind mill. Working and maintenance of wind mills.

(c) SOLAR ENERGY TECHNOLOGY:

Solar radiation and potentiality of solar radiation in India. Application of solar energy-solar cooker,solar crop dryer, solar water heater and solar Photovolatic Technology.

Solar collector-flat plate collector, concentration or focussing type collector.

PRACTICALS

LIST OF EXPERIMENTS:

1. Familiarisation with different gauges and controls of tractors and pre starting checks.
2. Tractor driving practice
 - (a) Without implements in limited space like L shape, T shape & circle etc.
3. Practice of power tiller operations.
4. Hitching of trailer and different implements. Practice of trailer reversing.
5. Study of components and working of engines; two & four stroke cycle engines
 - (a) With the help of cut way model.
 - (b) Practice of starting, running adjusting and stopping, common trouble shooting.
 - (c) Operation of biogas engine.
6. Study of valve arrangement, valve tuning and firing order. Valve grinding and setting of valve timing.
7. Study of diesel fuel supply system, air bleeding.
8. Study of battery, periodic battery care, ignition system and spark plug gap adjustment.
9. Study of cooling system in tractors and stationary engines.
10. Study and servicing of Lubrication system.
11. Study of transmission system.
12. Periodic maintenance of engines and tractors.
13. Visit to go-bar gas plant and draw its sketch.
14. Study of wind mill

4.4 ELECTRICAL ENGG. & RURAL ELECTRIFICATION

L T P
5 - 4

RATIONALE

The electricity plays vital role in every sphere of life. In fact without electricity, no one can think of any development. Keeping in view the importance it became essential to make it available in rural areas. Without the knowledge of its production, transmission and equipments/appliances it shall not be possible to make the most efficient use of available energy which is scarce. Hence this subject provides a satisfactory knowledge to the agricultural engineering diploma holders to cater to the needs of the modern age.

TOPICWISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	L.	T.	P.
A.	MACHINES			
1.	D.C. Machines	9		
2.	Elements of A.C.	9		
3.	A.C. Machines	9		
4.	Transformers	9		
5.	Transmission & distribution	9		
6.	Rural electrification	9		
B.	MESSURING INSTRUMENTS			
1.	Working principle and construction of Instruments	8		
2.	Measurement of power	8		
	TOTAL	70	-	56

DETAILED CONTENTS:

- A MACHINES
1. D.C. Machines:

Principle of operation of D.C. Motor, E.M.F. equation, types and their uses. Principle of operation of D.C. Generators, types & application.

2. Elements of A. C.:

Definition, production of A.C., parameters. Instantaneous values peak, value, R.M.S. Value, Average Value, difference between direct current and alternating current.

3. A.C. machines:

Principle of operation and application of
(i) Alternator
(ii) Synchronous motor,
(iii) Induction motor.

4. Transformer:

Principle, operation, transformation ratio, application, cooling system. Types: Step down and step up transformers.

5. Transmission and Distribution:

Importance, necessity of transmission, transmission losses and how to minimize it. Basic idea about power transmission and substation. Method of distribution of electrical power.

6. Rural Electrification:

1. Electrical appliances: Switches, fuses, regulator boards.
2. Types of house wiring and wiring materials: wires, battens, conduit pipe (plastic and metal), clips etc.
3. Wiring tools and equipments.
4. Calculation of energy consumption and preparation of bills.
5. Street light connection.
6. Cables - Utility, specifications and installation with respect to save energy and economy.
7. General idea about the rules of U.P. Electricity Board for rural electrification.

B MEASURING INSTRUMENTS

1. Working principles and construction of the following instruments:
 - (a) Ammeter and voltmeter (moving coil and moving iron type)
 - (b) Dynamometer type wattmeter
 - (c) Energy Meter
2. Measurement of power in single phase and three phase circuits by wattmeter

PRACTICALS

LIST OF EXPERIMENTS:

1. To Connect a single phase load with single phase supply and measure current, voltage, power and power factor.
2. To study and sketch single phase energy meter and calibrate it at different loads.
3. Stair-case wiring.
4. Study of D.O.L.starter and to connect three-phase motor with it.
5. To study star Delta starter -
 - (a) Manually operated.
 - (b) Automatic type.
6. To measure power and power factor of single phase circuit by a 3 voltmeter method, by 3 ammeter
7. To determine turn ratio and efficiency and regulation of a single phase transformer.
8. Estimation of cost of materials of wiring for a farm house specially batten and conduct wiring.
- 9.a) Electrical precautions to be strictly observed while working with appliances/equipments/supply lines especially for human safety.
 - b) Knowledge of First-Aid to be provided to the person involved in an accident by electricity.
10. Earthing of electrical equipments.

4.5 AGRICULTURAL ENGG. DRAWING

L T P
- - 8

RATIONALE

In the field an agricultural engineering diploma holder shall come across to various civil engineering structures as irrigation structures, farm road, earthen dams and storage bins etc. For constructing the above mentioned structures economically and effectively he must be able to interpret civil engineering drawing correctly.

An agricultural engineering diploma holder shall also come across different machines in different section and he may be involved in fabrication /manufacture/ repair and maintenance / floor level assembly of parts etc. For performing the above job effectively and economically he must be able to interpret the machine drawings correctly.

Therefore the knowledge of civil engineering drawing as well as mechanical engg. drawing is very essential for an agricultural engg. diploma holder.

TOPICWISE DISTRIBUTION OF PERIODS

S.NO.	TOPIC	NO. OF PLATES	PERIODS
A. Machine Drawing:			
1.	Introduction		2x2
2.	Cotter and knuckle joints	1	3x2
3.	Bearings	1	4x2
4.	Couplings	1	4x2
5.	I.C. Engine Piston and Piston ring, connecting rod	1	4x2
6.	Screw Jack	1	2x2
7.	Free hand proportional sketches of different machine		
	a. Shovel and Tynes of Cultivator.	1	2x2
	b. Wheat thresher.	1	2x2
	c. Spool for the disc harrow.	1	2x2
	d. Mould Board Plough, Dis Plough & Reaper Cutter bar	1	2x2
B. Civil Engineering Drawing:			
1.	Farm House	1	2x2
2.	Cattle barn	1	4x2
3.	Poultry House	1	4x2

4.	Doors and windows	1	4x2
5.	Gobar Gas Plant	1	4x2
6.	Cross section of rural road & rural sanitation	1	5x2
7.	Sectional view of India Mark-II Hand Pump.		
TOTAL		15	50X2 =100

DETAIL CONTENTS

A. MACHINE DRAWING:

1. Introduction:

Concept of half sectional and full sectional views.
Concept of working drawing of assemblies from given components showing models of any machine.

2. Detail drawings of the following :

1. Two views of each, out of which one should be sectional view.
2. Cotter and knuckle joints
3. Bearings : Foot step bearing and pedestal bearing
4. Couplings : Flanged coupling and flexible coupling
5. I.C. Engine: piston, piston rod and connecting rods
6. Screw Jack
7. Free hand proportional sketches of the following agricultural implements and their components:
 - a. Shovel and cultivator
 - b. Simple drum type wheat thresher exploded view.
 - c. Spool for the disc harrow.
 - d. Mould Board Plough, Dis Plough & Reaper Cutter bar

B. CIVIL ENGINEERING DRAWING

Plan, elevation and section of following rural structures:

1. Farm House
2. Cattle barn

3. Poultry farm
4. Doors and windows : braced and battened door, fully panelled door and window, partially glazed and partially panelled door and window.
5. Drawing of Gobar gas plant of fixed dome type showing different parts and their sizes through visit to a nearby plant.
6. Rural roads and sanitation - cross section of a rural road showing drains and trees etc., plan and section of septic tank and soakpit for a moderate rural family (6 to 10 users) as per BIS specification.
7. Sectional view of India Mark-II Hand Pump.

4.6 DAIRY AND FOOD ENGINEERING

L T P
6 - -

Rationale :

Milk & food is an important ingredient for health and therefore it is universally utilised by human being of all age groups. The supply terminals are normally situated at distant places from the processing units. Therefore effective methods of milk & food collection and storage are required to avoid microbiological contamination of milk & food. The students are required to be trained in handling of milk & food at preprocessing stage.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
A.	DAIRY ENGINEERING			
1.	Introduction.	5	-	-
2.	Milk receiving equipment/Soyabean Milk	5	-	-
3.	Storage equipment.	12	-	-
4.	Heat exchanging equipments.	12	-	-
5.	Installation of infloor and on floor conveyor.	6	-	-
6.	Ice Cream Equipments.	6	-	-
7.	Homogenisers, Soyabean Pulp Grinder	6	-	-
8.	Cream, Butter and Ghee Equipments, Panner and Toffu Making	12	-	-
9.	Evaporators & Dryers	5	-	-
B.	FOOD ENGINEERING	15	-	-
-		84	-	-

DETAILED CONTENTS

1. INTRODUCTION:

Sanitary features, sanitary pipes and fittings stainless steel pipes, glass pipes, plastic tubing, pipe and fitting standards, sanitary pipe and fitting. Sanitary pumps, centrifugal pump. Positive displacement pump specification, stuffing box, rotary seal.

2. MILK RECEIVING EQUIPMENT/ SOYABEAN MILK:

Weigh can and receiving tank, chilling equipment, weighing and measuring milk standards. Canwashers-principles of operation. Rotary and straight through can washer.

3. STORAGE EQUIPMENT:

Insulated storage tank. refrigerated storage tanks specification for the storage tanks. Milk transport tank. Milk processing equipments, separators-warm, milk separators-cold milk separators, Centrifugals cream separators.

4. HEAT EXCHANGING EQUIPMENT:

Heat exchangers, Pasteurization - Batch type and continuous type Pasteurizing plants, purpose and special requirement. High temperature short time pasteurizer, utilities, regeneration, holding time. Metering pump and drive F.D.V. UHT (Ultra High Temperature) Pasteurizers.

5. INSTALLATION OF INFLOOR AND ONFLOOR CONVEYOR:

Different types of conveyors used in dairy industry, their drives, take up units. conveyor components, Case stackers and unstackers, platising milk cases, handling of dispenser milk containers, handling of ice cream.

6. ICE CREAM EQUIPMENTS:

Ice cream freezer batch freezer, Continuous freezers, type of designs, air incorporation, over run, control systems, freezing cylinder, dasher, scrapping blades, controls of refrigeration.

7. HOMOGENISERS, SOYABEAN PULP GRINDER:

Theory of homogenization, design, material, single stage and two stage homogenizers, efficiency of homogenization.

8. CREAM, BUTTER AND GHEE EQUIPMENT, PANEER AND TOFFU MAKING:

Cream ripening tanks, design, material, automatic control, operation, cleaning, maintenance of Continuous Butter making equipment. Wooden churn, metal churn. Ghee pan and Ghee making equipments

9. EVAPORATORS & DRYING EQUIPMENTS :

Introduction of evaporators, single and multiple operation, Introduction of drum dryer and spray dryer.

B. FOOD ENGINEERING :

Physical properties of food materials, Unit operation in food engineering : Grinding, Crushing, Mixing, Blending, Thermal processing, Dehydration. Packaging materials and methods of packing of different food products. Preservation of food product, site selection and plant layout and their cost economics.

NOTE : For Practical knowledge of above subject one week summer in plant training must be provided in Dairy Plant and report should also be submitted in the department by each student.

4.7 ENERGY CONSERVATION

L T P
3 - 2

RATIONALE

The requirement of energy has increased manifold in last two decades due to rapid urbanization and growth in industrial/service sector. It has become a challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as an additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

DETAILED CONTENTS

1. **Basics of Energy**
 - 1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
 - 1.2 Global fuel reserve
 - 1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
 - 1.4 Impact of energy usage on climate
2. **Energy Conservation and EC Act 2001**
 - 2.1 Introduction to energy management, energy conservation, energy efficiency and its need
 - 2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.
 - 2.3 Standards and Labeling
 - 2.3.1 Concept of star rating and its importance
 - 2.3.2 Types of product available for star rating
3. **Electrical Supply System and Motors**
 - 3.1 Types of electrical supply system
 - 3.2 Single line diagram
 - 3.3 Losses in electrical power distribution system
 - 3.4 Understanding Electricity Bill
 - 3.4.1 Transformers Tariff structure
 - 3.4.2 Components of power (kW, kVA and kVAR) and power factor, improvement of power factor

3.4.3 Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

3.5 Transformers

- 3.5.1 Introduction
- 3.5.2 Losses in transformer
- 3.5.3 Transformer Loading
- 3.5.4 Tips for energy savings in transformers

3.6 Electric Motors

- 3.6.1 Types of motors
- 3.6.2 Losses in induction motors
- 3.6.3 Features and characteristics of energy efficient motors
- 3.6.4 Estimation of motor loading
- 3.6.5 Variation in efficiency and power factor with loading
- 3.6.6 Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

4.1 Pumps

- 4.1.1 Introduction to pump and its applications
- 4.1.2 Efficient pumping system operation
- 4.1.3 Energy efficiency in agriculture pumps
- 4.1.4 Tips for energy saving in pumps

4.2 Compressed Air System

- 4.2.1 Types of air compressor and its applications
- 4.2.2 Leakage test
- 4.2.3 Energy saving opportunities in compressors.

4.3 Energy Conservation in HVAC and Refrigeration System

- 4.3.1 Introduction
- 4.3.2 Concept of Energy Efficiency Ratio (EER)
- 4.3.3 Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5 Lighting and DG Systems

5.1 Lighting Systems

- 5.1.1 Basic definitions- Lux, lumen and efficacy
- 5.1.2 Types of different lamps and their features
- 5.1.3 Energy efficient practices in lighting

5.2 DG Systems

- 5.2.1 Introduction
- 5.2.2 Energy efficiency opportunities in DG systems
- 5.2.3 Loading estimation

6 Energy Efficiency in Thermal Utilities

6.1 Thermal Basics

- 6.1.1 Types of fuels
- 6.1.2 Thermal energy
- 6.1.3 Energy content in fuels
- 6.1.4 Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces

- 6.2.1 Introduction and types of boilers
- 6.2.2 Energy performance assessment of boilers
- 6.2.3 Concept of stoichiometric air and excess air for combustion
- 6.2.4 Energy conservation in boilers and furnaces
- 6.2.5 Do's and Don'ts for efficient use of boilers and furnaces

6.3 Cooling Towers

- 6.3.1 Basic concept of cooling towers
- 6.3.2 Tips for energy savings in cooling towers

6.4 Efficient Steam Utilization

7 Energy Conservation Building Code (ECBC)

- 7.1 ECBC and its salient features
- 7.2 Tips for energy savings in buildings
 - 7.2.1 New Buildings
 - 7.2.2 Existing Buildings

8 Waste Heat Recovery and Co-Generation

- 8.1 Concept, classification and benefits of waste heat recovery
- 8.2 Concept and types of co-generation system

9 General Energy Saving Tips

Energy saving tips in:

- 9.1 Lighting
- 9.2 Room Air Conditioner
- 9.3 Refrigerator
- 9.4 Water Heater
- 9.5 Computer
- 9.6 Fan, Heater, Blower and Washing Machine
- 9.7 Colour Television
- 9.8 Water Pump
- 9.9 Cooking
- 9.10 Transport

10 Energy Audit

- 10.1 Types and methodology
- 10.2 Energy audit instruments
- 10.3 Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

5.1 INTEGRATIVE COMMUNICATION

L	T	P
-	-	4

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Units	Coverage Time		
		L	T	P
1.	Introduction to Personality Development	-	-	02
2.	Factors Influencing / Shaping Personality	-	-	02
3.	Self Awareness - 1	-	-	03
4.	Self Awareness - 2	-	-	02
5.	Self Awareness - 3	-	-	02
6.	Change Your Mind Set	-	-	02
7.	Interpersonal Relationship and Communication	-	-	03
8.	Non-Verbal communication Communication Skills	-	-	02
9.	Communication Skills ACTIVITIES	-	-	06
10.	Body Language skills	-	-	03
11.	Leadership Traits & Skills	-	-	03
12.	Attitude	-	-	03
13.	Analyzing & Solving a Problem skills	-	-	02
14.	Time Management skills	-	-	03
15.	Stress Management Skills	-	-	02
16.	Interview Skills	-	-	04
17.	Conflict Motives	-	-	02
18.	Negotiation / Influencing Skills	-	-	02
19.	Sociability	-	-	03
20.	Importance of Group	-	-	03
21.	Values / Code of Ethics	-	-	02
-		-	-	56

PERSONALITY DEVELOPMENT**1 Introduction to Personality Development**

AIM, Skills, Types of Skills, LIFE SKILLS VS OTHER SKILLS, Concept of Life Skills. Ten core Life Skills identified by

WHO

2. Factors Influencing / Shaping Personality :

Introduction, Physical and Social Factors Influencing / Shaping Personality (Hereditary, Self-Development, Environment, Education, Life-situations) Psychological AND Philosophical

Factors Influencing / Shaping Personality (Past Experiences, Dreams and Ambitions, Self-Image, Values)

3. Self Awareness - 1

DIMENSIONS OF SELF AWARENESS (Self Realization, Self Knowledge or Self Exploration, Self Confidence, Self Talk, Self

Motivation, Self Esteem, Self Image, Self Control, Self Purpose, Individuality and Uniqueness, Personality, Values, Attitude, Character), SELF REALIZATION AND SELF EXPLORATION THROUGH SWOT ANALYSIS AND JOHARI WINDOW,

4. Self Awareness - 2

SYMPATHY VS EMPATHY AND ALTRUISM, Importance of Empathizing with Others,

5. Self Awareness - 3

Self-Awareness through Activity, Body Image (What is Body Image, What Decides our Body Image, What is Poor Body Image, What are the Harmful Effects of Poor Body Image), Tackling Poor Body Image(Enhance Self-Esteem, Build Up Critical Thinking, Build up Positive Qualities, Understand Cultural Variation, Dispel Myths, Utilize Life Skills)

6. Change Your Mind Set

What is Mindset, HOW TO CHANGE YOUR MINDSET (Get the Best Information Only, Make the best people your Role Model, Examine Your Current Beliefs, Shape Your Mindset with Vision and Goals, Find Your Voice, Protect Your Mindset, Let Go of Comparisons, Put An End To Perfectionism, Look At The Evidence, Redefine What Failure Means, Stop Worrying About What "People" Think)

INTERPERSONAL SKILLS

7. Interpersonal Relationship and Communication

INTERPERSONAL RELATIONSHIP , Forms of Interpersonal Relationship, Must Have in an Interpersonal Relationship, Interpersonal Relationship between a Man and a Woman (Passion, Intimacy, Commitment), Relationship Between Friends, ROLE OF COMMUNICATION IN INTERPERSONAL RELATIONSHIP (Take Care Of Your Tone And Pitch, Choice of Words is Important in Relationships, Interact Regularly, Be Polite, Try To Understand The Other Person's Point Of View As Well, Individuals Can Also Communicate Through Emails,

8. NON-VERBAL COMMUNICATION Communication Skills

Non-Verbal Communication, We Communicate with Our Eyes, Communication with Facial Expression, A Good Gesture, Appearance, Posture and Gait, Proximity and Touch), IMPORTANCE OF LISTENING, Characteristics of Good and Effective Listener(Is Attentive, Do

Not Assume, Listen for Feelings and Facts, Concentrate on the Other Speakers Kindly and Generously, Opportunities)

9. Communication Skills ACTIVITIES -

Activities in Making Collages, Making Advertisements, PPT Preparation & Presentation, Speaking -Seminars, Group Discussions, Debates, Extempore Speeches, Listening to an audio clip and telling its gist, Answering a telephone call, Making enquiries, General tips- Pronunciation, Tone, Pitch, Pace, Volume, relevance, brief, simple Reading Newspaper, Magazines (Current Affairs, Economic magazines, Technical magazines), How to read a report, article, Writing- Resume Writing, Writing joining report, Notice writing, Report making, Proposal writing, Advertisement, Notice for tender, Minutes writing, E-Mail writing, Listening News, Listening to audio clips.(Lecture, poetry, speech, songs),

10. Body Language skills

Introduction, What is Body Language , Body Language Parts, Personal Space Distances (Intimate Distance, Personal Distance, Social Distance, Public Distance), IMPORTANT BODY LANGUAGE SIGNS AND THEIR MEANING

UNDERSTANDING OTHERS

11. Leadership Traits & Skills :

Introduction, Important Leadership Traits (Alertness, Bearing, Courage, Decisiveness, Dependability, Endurance, Enthusiasm, Initiative, Integrity, Judgment, Justice, Knowledge, Loyalty, Sense of Humour), Other Useful traits (Truthfulness, Esprit-de-corps, Unselfishness, Humility and sympathy, Tact without loss of moral courage, Patience and a sense of urgency as appropriate, Selfconfidence, Maturity, Mental including emotional stability)

12. Attitude

Types of Attitude, Components of Attitudes (Cognitive Component, Affective Component, Behavioral Component), Types of Attitudes (Positive Attitude, Negative Attitude, Neutral Attitude, Rebellious Attitude, Rational and Irrational Attitudes, Individual and Social Attitudes), Kinds of Attitude, ASSERTIVENESS, How to Develop Assertiveness (Experiment and Try New Things, Extend Your Social Circle, Learn to Make Decisions for Yourself, Indulge in Knowledge, Admire Yourself

&

Others), Negotiation (Be Sensitive to The Needs Others, Be Willing To Compromise, Develop Your Problem-Solving Skills, Learn to Welcome Conflict, Practice Patience, Increase Your Tolerance For Stress, Improve Your Listening Skills, Learn To Identify Bottom-Line Issues Quickly, Be Assertive, Not Aggressive)

PROBLEM SOLVING

13. Analyzing & Solving a Problem skills

Critical Thinking, Creative Thinking, Decision Making, Goal Setting & Planning, Problem Solving

14. Time Management skills

Need of Time Management, TIME WASTERS (Telephone, Visitors , Paper work, Lack of Planning & Fire Fighting , Socializing , Indecision , TV , Procrastination), PRINCIPLES

OF

TIME MANAGEMENT - Develop a Personal Sense of Time (Time Log , value of other people's time), Identify Long-Term

Goals ,

Concentrate on High Return Activities , Weekly & Daily

Planning

(The Mechanics of Weekly Planning , Daily Planning), Make

the

Best Use of Your Best Time , Organize Office Work

(Controlling

Interruptions , Organizing Paper Work), Manage Meetings, Delegate Effectively, Make Use of Committed Time, Manage Your Health,

15. Stress Management Skills

INTRODUCTION, Understanding Stress and its Impact, Expected Responses (Physical, Emotional, Behavioral), stress signals(thoughts, feelings, behaviors and physical), STRESS MANAGEMENT TECHNIQUES (Take Deep Breath, Talk It Out, Take A Break, Create a Quite Place in Your Mind, Pay

Attention

to Physical Comfort, Move, Take Care of Your Body, Laugh, Mange Your Time, Know Your Limits, Do You Have To Be Right Always, Have A Good Cry, Look for the Good Things Around You, Talk Less, Listen More), UNDERSTANDING EMOTIONS AND FEELINGS-through Activity

16. Interview Skills (2 sessions from Industry Expert is Compulsory)

Curriculum Vitae (When Should a CV be Used, What Information Should a CV Include, personal profile, Covering Letter, What Makes a Good CV, How Long Should a CV Be, Tips on Presentation), Different Types of CV (Chronological, Skills-Based), BEFORE THE INTERVIEW , CONDUCTING YOURSELF DURING THE INTERVIEW , FOLLOWING THROUGH AFTER THE INTERVIEW , Interview Questions To Think About , MOCK INTERVIEW - Activity (MOCK INTERVIEW

EVALUATION - NON-VERBAL BEHAVIORS, VERBAL BEHAVIORS, General Etiquettes to face the Board , Telephonic interview

17. Conflict Motives -Resolution

Motives of Conflict(Competition for Limited Resources, The Generation Gap and Personality Clashes, Aggressive Personalities, Culturally Diverse Teams, Competing Work and Family Demands, Gender Based Harassment), Merits and Demerits of Conflict , Levels of Conflict (Interpersonal Conflict, Role Conflict, Inter-group Conflict, Multi-Party Conflict, International Conflict), Methods of Conflict Resolution (The Win-Lose Approach, The Lose-Lose Strategy, The Win-Win Approach), Techniques for Resolving Conflicts (Confrontation and Problem Solving Leading to Win-Win, Disarm the Opposition, Cognitive Restructuring, Appeal to Third Party, The Grievance Procedure)

18. Negotiation / Influencing Skills

Why Influencing, What Is Influencing, TYPES OF INFLUENCING SKILLS (Probing And Listening, Building Rapport, Sign Posting, Pacing, Selling, Assertiveness), LAWS AND PRINCIPLES OF INFLUENCE, The Six Laws of Influence (The Law of Scarcity, The Law of Reciprocity, The Law of Authority, The Law of Liking, The Law of Social Proof, The Law of Commitment and Consistency), Influencing Principles (Making a Start, Buy Yourself Thinking Time, Dealing With Disagreement, Difficult And Sensitive Situations)

19. Sociability : Etiquettes And Mannerism & Social Skills

Need for Etiquette , Types of Etiquettes (Social Etiquette, Bathroom Etiquette, Corporate Etiquette, Wedding Etiquette, Meeting Etiquette, Telephone Etiquette, Eating Etiquette, Business Etiquette, E-Mail Etiquettes,), MANNERISMS, HOW TO IMPROVE YOUR SOCIAL SKILLS (Be Yourself, Be Responsible, Be Open & Approachable, Be Attentive, Be Polite, Be Aware, Be Cautious)

20. Importance of Group / Cross Cultural Teams / Team Work skills

Introduction, Types and Characteristics of Groups (Definition of a Group, Classification / Types of Groups, Friendship Group, Task Group, Formal Groups, Informal Group, Effective Group), Importance of a Group, Characteristics of a Mature Group, TYPES AND CHARACTERISTICS OF A TEAM (Definition of a Team, Types of Teams, Functional Teams, Problem Solving Teams, Cross - Functional Teams, Self - Managed Teams),

Importance of a Team, Characteristics of a Team

21. VALUES / CODE OF ETHICS

Meaning, A FEW IMPORTANT VALUES (Honesty, Integrity, Purity, Discipline, Selflessness, Loyalty, Fairness, Equality, Trust, Support, Respect, etc)

Note : One Orientation module for the faculty is must.
Involvement of Industry Experts is necessary for Interview Skills

5.2 MINOR IRRIGATION AND TUBE WELL ENGG.

L T P
5 - 4

RATIONALE:

The knowledge of this subject will help the learner to equip them with the importance of minor irrigation net works and tubewells in increasing the agricultural production. Design of the network and tube wells with optimum efficiency will help generating extra income through cash crops etc. to farmers.

TOPICWISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	L.	T.	P.
<hr/>				
(A)	MINOR IRRIGATION			
1.	Introduction	5		
2.	Minor Irrigation & Tubewell Engineering	6		
3.	Planning & lay out	8		
4.	Minor Irrigation Equipments	10		
5.	Water pumping equipments	5		
6.	Sources of Minor Irrigation	5		
(B)	TUBEWELL ENGINEERING			
1.	Introduction	2		
2.	Site Selection	2		
3.	Drilling Methods and Rigs	2		
4.	Types of Tube wells	4		
5.	Strainers	4		
6.	Open wells	4		
7.	Pumps and pumping equipments	8		
8.	State Tube wells	4		
TOTAL		70	-	56

DETAILED CONTENTS:

(A) MINOR IRRIGATION

1. Introduction

Importance, necessity and advantages of minor irrigation.

2. Minor Irrigation & Tubewell Engineering:
Concept, application and scope of minor irrigation & Tubewell engineering.
 3. Planning & Layout:
Planning and layout of minor irrigation channel,
 4. Minor Irrigation Equipments:
Introduction of the following traditional water lifting devices:
Swing basket, mhot, rahat, charas, dhenkuli, Egyptian screw, Propeller pump, Axial flow pump.
 5. Water Pumping Equipments
Wind mills, hydrams, solar water pumps, principles, constructional details & working.
 6. Sources of minor irrigation:
Shallow & deep wells, water tanks and ponds, Confined and unconfined aquifer, development of well.
- (B) TUBE WELL ENGINEERING:
- Introduction:
Definition of tube well, need, advantages & disadvantages.
2. Selection of Site:
Characteristics of tube well site, factor affecting site selection.
 3. Drilling Methods:
Types of drilling methods, advantages of different methods. Types of rigs; Rotary & percussion rigs, their construction, installation and working.
 4. Types of Tube well
Types of tube well, advantages & disadvantages of each type, selection of tubewell for a given site.
 5. Strainers:

Types, method of design, comparison of different types of strainers.

6. Open Wells:

Design and construction of open wells.

7. Pump and Pumping equipments

Types, main features, working principle, selection of pumps and pumping equipment, centrifugal pump, Submersible and turbine pumps, performance, installation and Alignment of centrifugal pump. Submersible pumps, installation, operation and maintenance.

State Tube wells:

Importance in increasing agriculture production, command area and government policy about tubewells.

PRACTICALS

(Irrigation Engg. Lab)

LIST OF EXPERIMENTS 4 Periods/week

1. Study and sketch of spill ways and outlet.
2. Study of different types of methods of irrigation adopted for different crops at farmers field.
3. Study and sketch of infiltration and actual determinations of infiltration rate of soil in field.
4. Study and sketch different weirs, notches, orifices and flumes and flow measurement in channel.
5. Determination of discharge of a channel by
 - (a) Float method
 - (b) Current meter method
6. Study and sketch of Tensiometer and its use in determination of soil moisture.
7. To measure pressure head in saturated soil by piezometer.
8. To determine irrigation efficiencies in field:

- i. Water application ii. Water conveyance iii. water distribution
- 9. To determine consumptive use by weighing type evapotranspiration pan.
- 10. Preparation of drainage plans.
- 11. To determine yield of a tube well.
- 12. Study and sketch of the following:
(Any two)
 - i. Sprinkler Irrigation
 - ii. Drip Irrigation
 - iii. Wind Mill

5.3 POST HARVEST TECHNOLOGY & AGRO BASED INDUSTRIES

L T P
5 - 8

RATIONALE:

In agriculture harvesting and threshing at field are very important operations. Now a days at medium & large farms, these machines are used by agro-industries, corporations, agricultural engineering departments and large and medium size holdings and private organizations. For menning operation and maintenance of post harvest equipments supervisory personnels are required.

In view of the emphasis given by the government for conservation, storage and adding value to the agricultural produce, the post harvest technology has asumed special significance. Primary operation like drying, cleaning grading as well as storage management, layout of marketing yards and trans port system are worth mentioning. All these operation are done by the farmer at farm level, through corporation or by govt. level.

The contents of this subject have been developed to cater the above needs and equip them with the knowledge of post harvest techniques and equipments, so as to economise the processes and optimise the use of equipments and available infra structure.

TOPICWISE DISTRIBUTION OF PERIODS:

SL.NO.	TOPIC	L.	T.	P.
1.	Introduction	5		
2.	Drying	3		
3.	Cleaning and Grading	7		
4.	Sead Treatments	4		
5.	Bagging & Packaging	4		
6.	Storage	4		
7.	Material handling Equipment	6		
8.	Pertreatment/conditioning of Agricultural Produce	6		
9.	Milling of cereals, pulses and oilseeds And Indian Masalas (Spices)	9		
10.	Canning of Fruits & vegetables	4		
11.	Dehydration of Fruits & Vegetables	4		
12.	Processing of Fruits & Vegatbles	5		

13. Utilization of By Products	5
14. Agro-based industries	18
<hr/>	
TOTAL	70 - 112
<hr/>	

DETAILED CONTENTS

1. Introduction:

Importance of grain and seed processing principles of agricultural processing, sequence of operations, flow diagram, services offered by processor to farmers and Under water grain storage

DIFFERENT STEPS INVOLVED IN SEED PROCESSINGS.

2. Drying

Importance of moisture in seed and grain representation. Determination of moisture, direct and indirect methods, process of drying such as constant rate period and falling rate period. Drying kinds: thin layer and deep-bed drying. Temperature and air flow requirement, natural air and heated air drying, solar drying. Direct and Indirect dryers, their efficiency and economics.

3. Cleaning and Grading :

Importance, elementary, study of related machines, their operations and maintenance such as scalper, air screen cleaner, rotary cleaner, spiral separator, indented cylinder separator, gravity separator, Debearder.

4. Seed Treatment:

Seed treatment methods, elementary study of seed treating equipments such as powder and slurry seed treater and their advantages.

5. Bagging & Packaging:

Manual bagging, semi-automatic bagging Machines and automatic bagging machines. Packaging materials and their utilization

6. Storage:

Storage of seed and grain, respiration and factors affecting it, changes in stored product during storage, loss

of germination and seed viability. Design of storage system and equipments. I.S.I. code practice. Storage of fresh fruits, vegetables and dairy products.

7. Material Handling Equipment:

Belt conveyor, screw conveyor, pneumatic conveyor, bucket elevator, their operation and maintenance

8. Pretreatment/Conditioning of Agricultural Produce For Milling:

Parboiling of paddy, Methods and machinery used for parboiling, pretreatment of pulses and oil seeds for milling.

9. Milling of Cereals, Pulses and Oil Seeds & Indian Masalas (Spices):

Methods and machinery used for milling for cereals pulses and oil seeds such as paddy, wheat, arhar and mustared. Elementary knowledge of solvent extraction plant.

10. Canning of Fruits and Vegetables :

Methods and machinery used for canning, advantage of canning.

11. Dehydration of Fruits and Vegetables :

Methods and machinery used for dehydration of fruits and vegetables such frey drier, solam drier, Advantage of dehydration.

12. Processing of Fruits & vegetables For Preparation of Jam, Jolley Squash, Betchup, Etc.:

Methods and machinery used for preparation of Jam, Jelly, Squash, Betchup, Catney, Morabba, etc.

13. Utilization of By-Products :

Utilization of paddy husk, rice bran, paddy straw, corn cob; Bio-methanation of fruits and vegetable waste, Crasification of agricultural based celulosie materials.

10. Agro-Based Industires:

Sugarcane crushing, khandsari and Gur making process and equipment; Preparation of Soybean and Potato based products

such as Soyamilk, Soypaneer, Soybiscuits Papad, chips Waffers, etc.; Briquetting of agricultural waste to use as fuel, Card Board preparation from paddy straw.

PRACTICALS

Study and operation of the following:

1. Air screen cleaner and other cleaning equipments.
2. Heated air dryer.
3. Screw conveyor, bucket elevator & belt conveyor
4. Slurry seed treater and mixer
5. Case Study of the following available in through visits:
 - a. Modern Rice Mill
 - b. Cold Storage/Appropriate technology for short duration storage at village level.
 - c. Specific gravity separator
 - d. Processing and storage plant
 - e. Gur making unit
 - f. Soybean processing unit
 - g. Canning and packaging of fruits and vegetables.
 - h. Khandsari sugar making unit
 - i. Vegetable dehydrating unit
 - j. Seed germinating unit
6. Preparation of Mango, Guava, Karaunda and Apple jelly.
7. Preparation of Orange squash and Lamon squash.
8. Preparation of ketchup of different fruits.
9. Agrowaste composite materials

5.7 ESTIMATING & COSTING

L T P
7 - -

RATIONALE:

This is one of the core subject of Agricultural Engineering as it enables the students to estimate the cost of Civil Engg. Agricultural structures and cost of producing a mechanical machine or equipment used in maintenance work or expenditure on spares. They will know the working of contractors, estimators, supervisors & valuers. The study of this subject makes them efficient supervisors & good executives in Agricultural Engineering field.

TOPICWISE DISTRIBUTION OF PERIODS

SL.NO.	TOPIC	PERIODS
(A) CIVIL ENGG.		
1.	Introduction	8
2.	Measurement of work	6
3.	Rate analysis	8
4.	Estimates of diff. item of works of a building	10
5.	Estimates of a complete village house	6
6.	Calculation of material	4
7.	Estimates of earth work of a road	6
8.	Estimates of irrigation and drainage channels	10
(B) MECHANICAL ENGG.		
1.	Estimation of Material requirment	12
2.	Estimation of a welding	10
3.	Estimation of forging	8
4.	Estimates of cost	10

DETAILED CONTENTS:

1. Introduction:

Definition of estimating, purpose, types of estimate, preliminary estimate, cubical content estimate, plinth area estimate, approximate quantity method estimate, detailed or item rate estimate, revised supplementary estimate, annual repair cost and special repair estimate. Bill of quantities, abstract of cost, prerequisites of estimating that is drawing, specification, rates, general and detailed specifications.

2. Measurement of work:

Units of measurement, general rules of taking measurement, units of payment, method of measuring quantities- centre line method, long and short wall or out and in to in methods.

3. Analysis of Rates:

Schedule of rate, need of analysis of rates, requirement of labour for different works as per NBO, requirement of material for different works, preparation of analysis of rate of 10 important works.

4. Estimate of different work of a building & roads & farm structures:

(a) Earth work in foundation, steps, dwarf wall, boundary wall

(b) Concrete in foundation

(c) Brick masonry in footings

(d) Brick masonry upto plinth

(e) Brick masonry in super structure

(f) D.P.C.

(g) R.B. and R.C. works

(h) Flooring

(i) Sand/earth filling

(j) Plastering and pointing

(k) White washing and colour washing

(l) Site development

(m) Antitermite treatment

(n) Arches and roofs

(o) Water supply and sanitary works:

(i) Bath room and W.C. including fittings

- (ii) Septic tank and soakpit
- (iii) P.R.A. type latrine
- (p) Doors and windows
- (q) Misc. other works

5. Estimate of a complete Village House

6. Calculation of materials:

Calculation of quantities of different materials from estimated quantities of items like brick work, cement concrete R.B. and R.C. work.

7. Estimate of earth work of road:

Calculation of land areas and volumes-Prismoidal formula, mass diagram, methods of taking out and scheduling quantities for various items such as culverts and bunds. Earth work volumes by spot levels and contours.

8. Estimates of irrigation and drainage channels:

Specifications and estimating quantity and cost of irrigation and drainage channels.

(B) MECHANICAL ESTIMATING:

1. Estimation of materials: Estimation of weight of a simple machine part.,

2. Estimation of Welding:

Material cost, fabrication cost, welding cost & finishing cost, overhead cost, labour accomplishment factor and cumulative effects of poor practices on cost. Calculation of cost of welding, gas consumption and welding electrodes.

3. Estimation of Forging:

Concept of losses in forging operation. Estimation for the stock required for hard forging considering scale and shear losses.

4. Estimation of cost:

Concept of costing, brief description of direct materials, indirect materials, direct labour, indirect labour and overhead expenses

5.5 AGRICULTURAL, INDUSTRIAL FINANCE AND RURAL ENTREPRENEURSHIP

L T P
2 - 3

RATIONALE

A diploma holder in Agricultural Engineering very often has to work with village folk. For this purpose he must have a good rapport with the villagers. So a diploma holder in Agricultural Engg. should be able to apply the principles of rural sociology and social behaviour for rural people in his job and provide leadership in the development of rural areas.

Therefore, the knowledge of development of rural area is very much needed to an agricultural engineering technician.

The curriculum of diploma course in Agricultural Engineering is being developed keeping in view the job opportunities in the field. It has been experienced that students who opt for diploma course are fairly intelligent and enterprising. It has also been experienced that all students who pass out diploma do not go for jobs. Persons who possess entrepreneurial traits and attributes prefer setting up their own small scale industries/ business venture instead of seeking jobs.

The percentage of students who like to set up their own industrial/ business venture could be increased by way of introducing entrepreneurship development in agricultural engineering curriculum.

The contents of this subject have been developed to cater the above needs.

The contents of this subject have developed to cater to above needs.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	TOPIC	L.	T.	P.
(A) RURAL DEVELOPMENT				
1.	Introduction			1
2.	Spheres of rural development			1
3.	Govt and private agencies engaged in this activity			
4.	Financing agencies and their working procedures.			1
5.	Govt. Schemes for rural development			1
6.	Community development			1
7.	Rural Extension			1
(B) ENTREPRENEURSHIP DEVELOPMENT				
1.	Introduction			1
2.	Industries (Agro based)			1
3.	Market Survey			1
4.	Industrial Management			1
5.	Industrial Legislation & Taxes.			2

6.	Project Report	2
(C)	Industrial Management	
1.	Organisation	2
2.	Layout	3
3.	Material Management	3
4.	Replacement of machinery	2
5.	Purchase organisation	2
6.	Human Resoruce Management	2

TOTAL		28 - 42

DETAILED CONTENTS

(A) RURAL DEVELOPMENT

1. Introduction: Importance of rural development , need of development.
2. Spheres of rural development:
 - (a) Social (b) Education (c) Health (d) Housing (e) Sanitation and drainage (f) Industrial (g) Energy
3. Govt Agencies involved im rural development:

Block Development officer and its staff, Rural Enginnring department.
4. Financing Agencies and their working: Development banks, regional rural bank, commercial banks, lead bank, cooperative banks.
5. Govt Schemes for rural development: Trysem, IRDP, IRD, ACID (Agriculture credit intensive development scheme), DRI (Differential rate of Intrest scheme of banks, Insurance schemes.
6. Community Development: Philosphy, principle and objectives, organisational set up of blocks, Panchayat samiti, Gram vikas samiti etc.
7. Rural Extension: Rural Extension methods such Audio, Visual and Audio Visual. Use and role of information technology in rural development.

(B) ENTREPRENEURSHIP DEVELOPMENT

1. Introduction: Entrepreneur, entrepreneurship, its meaning & importance. Qualities of an entrepreneur. Entrepreneur Motivation Training (E M T). Ring toss, Achievement Planning, Tower Building.

2. Industries: Role and importance of small scale and other Industries. Classification of industries-village industry, tiny industry, small, medium and large scale industry. Ancillary industry. Identification of industry-resources, demand and skill based industry.

Financing Agencies for - Land, Infra Structure, Machinery, raw material, import of raw material and machinery. Marketing. Role and function of Govt. department connected with the development of industries in the State. Component of project report - Land, Building, Electricity, water, Equipment and other utilities. Materials, its availability, cost, labour availability and wage rates. Price of finished product.

3. Market Survey: Project selection based on market survey, demand and supply estimation, fast moving brands etc.
4. Industrial Management: Production planning and control, marketing management and liaison, Basic concept of marketing and salesmanship, marketing mix, working capital management, cash flow. Personnel management.

Limiting cost, budget and its control, book keeping, balance sheet, Break even analysis.

5. Industrial Legislation and Taxes: Industrial and Labour Laws, Production Tax, local tax, sales tax, excise duty, Income tax.
6. Project Report: Project report preparation and provisional registration.

Preparation of detailed project report (D. P. R.) for financial assistance.

(C) INDUSTRIAL MANAGEMENT:

1. Organisation:

Definition of good organisation. Principle of good organisation with merit & demerits.

2. Lay out:

Site selection of factory, influence of location on plant layout, factors considering for plant building. Definition of plant layout, objectives 2 principles. Types of plant layout.

3. Material Management:

Importance and function of material handling. Engineering & economics consideration devices. Relation between plant layout and material handling.

4. Replacement of Machinery:

Reason for machinery replacement. Depreciation, definition different method of calculation depreciation.

5. Purchase organisation:

Importance of good purchasing policy. Function of purchasing department. Duties of purchasing officer. Purchasing procedure.

6. Human Resource Management:

Human resource management, selection, performance appraisal, motivation and leadership and controlling.

PRACTICALS

RURAL DEVELOPMENT |

1. Socioeconomic Survey of a village selected in vicinity to polytechnic.

2. To find the problems of the village and suggest the solution in the development of the village from the study of the above survey in respect of :

a) Improvement suggested in agricultural activities.

b) Rural sanitation problems.

c) Rural Housing.

d) Energy development.

e) Promotion of traditional and other industries.

f) Farm mechanisation

Entrepreneurship Development:

To prepare a Project report for opening agro based industry and arrange resources for the same from financing agencies.

5.6 GREEN HOUSE TECHNOLOGY, HYDROPONIC AND AQUAPONIC ENGINEERING:

L T P
6 - 4

RATIONALE:

TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	TOPIC	L.	T.	P.
1.	Introduction To Green House	28		
2.	Introduction To Hydroponics	28		
1.	Introduction To Aquaponic	28		
TOTAL		84	-	56

DETAILED CONTENTS

1. INTRODUCTION TO GREEN HOUSE :
Types of green Houses, Environmental requirements in green house, Methods of Environmental control and fixtures, Chemical for control of insects, pest, etc. Soil mixture
2. INTRODUCTION TO HYDROPONIC :
Hydroponic history, use of hydroponic on land and on roofs, Chemical mixtures of hydroponic crops, Lighting fixtures, Infrastructure needs for supporting the hydroponic.
3. INTRODUCTION TO AQUAPONIC :
Basic meaning of aquaponics, The commercial need of aquaponic, use of aquaponic on land and roof, Aquaponic use for production of vegetables and flowers, Aquaponic structures and fixtures.

LIST OF PRACTICALS

1. Construction of green house (Low Cost).
2. Green house with Poly Film based, Glass fibre sheet based, Poly carbonet sheet based covering materials.
3. Green house with different growing mediums.
4. Green house environment maintaining fixtures-cooling, heating system, different type ventilators, etc, lower shutters with exhaust systems.
5. Hydroponics in different pots of shape and sizes and their respective materials.
6. Hydroponic crop grwoing - capsicum, tomato etc.
7. Aquaponics- Selection of fish and their behaviour, their differnt tank etc.

8. Aquaponic - Fixtures like air circulation pump, water circulation pumps, heating system etc.

VI Semester

6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

L T P
4 - -

RATIONALE:

A diploma student must have the knowledge of different types of pollution caused due to industrialisation and construction activities, so as he may help in balancing of eco-system and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.

TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Introduction	6		
2.	Pollution	4		
2.1	Water Pollution	8		
2.2	Air Pollution	8		
2.3	Noise Pollution	4		
2.4	Radio Active Pollution	6		
2.5	Solid Waste Management	6		
3.	Legislations	4		
4.	Environmental Impact Assessment	4		
5.	Disaster Management	6		
TOTAL		56	-	-

DETAILED CONTENTS

1. INTRODUCTION :
- Basics of ecology, Ecosystem, Biodiversity Human activities

and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.

- Lowering of water level , Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes .Use of biopesticides and biofungicides.
- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain,etc.

2. POLLUTION :

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION :

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, CO, CO₂, NH₃, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.

- A. Settling chambers
- B. Cyclones
- C. Scrubbers (Dry and Wet)
- D. Multi Clones
- E. Electro Static Precipitations

F. Bog Fillers.

- Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

2.4 RADISACTIVE POLLUTION :

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made thereunder-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.

- The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.
 - # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
 - # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003.
 - # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
 - # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
 - # Municipal Solid Wastes (Management and Handling) Rules, 2000.

The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT :

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan.

Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

6.2 IRRIGATION AND DRAINAGE ENGINEERING, RAIN WATER HARVESTING

L T P
6 - 4

RATIONALE:

This subject is essential to equip the learner with the knowledge of Irrigation and drainage of agricultural lands and conservation of water for optimizing the agricultural production in the most efficient and economical way. Problems of alkalinity and salinity can be also minimized to provide the efficient drainage systems on farms.

TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T.	P.
(A)	IRRIGATION ENGG.			
1.	Introduction	2		
2.	Sources of irrigation water	6		
3.	Ground water	6		
4.	Water Requirements of crops	6		
5.	Irrigation Methods & Design of Drip Irrigation System	8		
6.	Storage structures, Rain Water Harvesting Structures and Methods	6		
7.	Evaluation of Farm Irrigation Systems	6		
8.	Soil Moisture Movement	6		
9.	Design of Irrigation Channels	6		
(B)	DRAINAGE ENGG.			
1.	Introduction	2		
2.	Drainage investigations	6		
3.	Drainage Requirements	6		
4.	Drainage systems	12		
5.	Special Methods of Drainage	6		
TOTAL		84	-	56

DETAILED CONTENTS

1. Introduction:

Definition of Irrigation, History of Irrigation, Necessity and scope of Irrigation, Types of Irrigation.

2. Sources of Irrigation Water

Wells, rivers, ponds, canals, tube wells. Investigation and survey, selection of site and determination of capacity of storage reservoirs and tanks.

3. Ground Water:

Water bearing formation, confined and unconfined aquifers, static water level, piezometric surface, pumping water level, drawdown, area of influence, prediction of yield in confined and unconfined aquifer, well development.

4. Water requirement of plants:

Types of soils, soil properties in relation of irrigation and drainage, classes and availability of soil water, preparation of land for irrigation and drainage, quality of irrigation water, evaporation, transpiration, evapotranspiration, consumptive use, estimating crop water requirements, duty of water, delta, factors affecting duty methods of improving duty. Assessment irrigation water requirements of different crops, estimation of depth and time of irrigation, different criteria for irrigation scheduling depending upon soil-plant-atmospheric factors.

5. Irrigation Methods & Design of Drip Irrigation System :

Surface and subsurface methods, sprinkler and drip system of irrigation. Design of drip irrigation system : Laterals and Submain.

6. Storage Structures, Rain Water Harvesting Structures & Methods:

Introduction of different types of dams e.g. earthen dams, rockfilled, hydraulic filled etc.. Different types of spillways and outlets, cross sections of earthen dams, causes of failures of earthen dams.

7. Evaluation of Farm Irrigation Systems:

Measurement of irrigation efficiencies, water conveyance, storage, application, distribution and water use efficiency.

8. Soil Moisture Movement:

Soil moisture measurements, soil moisture tension, soil moisture characteristics curve, saturation and field

capacity, wilting point, moisture equivalent, percolation, seepage, infiltration, hydraulic conductivity, permeability.

10. Design of Irrigation Channels:

Non-erodible channels, design of open channels, maximum permissible velocity, channel slopes, free board, hydraulic sections, most economical section.

(B) DRAINAGE ENGINEERING:

1. Introduction:

Definition necessity water logging salinity, its control interrelationship of irrigation drainage, drainage coefficient, water table fluctuations.

2. Drainage Investigation & Requirements:

Estimation of drainage requirements, required water table depths, lowering of water table, ground water contours, drainage depths for different crops.

3. Drainage Systems:

Different types of surface and subsurface drainage systems, land smoothing, levelling and grading, design of surface drainage systems, different types of subsurface drainage systems and their design, tile drainage depth and spacing of tile drains, field survey, installation and layout of drains, installation of tile outlets.

4. Special Methods of Drainage:

Vertical drainage, mole drains, drainage of irrigated lands in arid and semi arid areas. Drainage for leaching.

6.3 SOIL WATER CONSERVATION AND LAND RECLAMATION
ENGINEERING

L T P
6 - 8

RATIONALE

This course is aimed to equip the learner with knowledge and skill required for taking effective measures against soil erosion, construction and maintenance of water conservation structures and development of land for irrigation and agricultural purposes.

The contents of the subject have been developed to inculcate capabilities for performing the above mentioned task economically and effectively.

OPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	TOPIC	L.	T.	P.
1.	Water Shed Management	5		
2.	Runoff & Hydrology	4		
3.	Soil-erosion	4		
4.	Soil & water conservation	4		
5.	Agronomic Measures	4		
6.	Mechanical Measures of erosion control	5		
7.	Conservation Measures for hill slopes	4		
8.	Gully erosion control & reclamation	5		
9.	Forestry management in soil conservation	5		
10.	Grassed waterways	4		
11.	Dry farming	5		
12.	Water conservation reservoirs	5		
13.	Flood Control	5		
14.	Land grading and land development	5		
15.	Wind erosion control	4		
16.	Land reclamation	4		
17.	Ravine reclamation	4		
18.	Command Area Development	4		
19.	Vermi Compost From Cowdung & Agricultural Waste	5		
TOTAL		84	-	112

DETAILED CONTENTS

1. WATER SHED MANAGEMENT :

Concept, objectives, use of remote sensing in water shed management, Planning, Ground water recharging, Water harvesting.

2. RUN OFF & Hydrology :

Definition, phenomenon and forms of run off characteristics of run off, factors affecting run off, measurement of run off by float, current meter and weirs, time of concentration and its impact on run off, estimation of peak run off rate by rational equation. Hydrology : Hydrologic cycle, importance, its components, occurrence and forms of precipitation; Characteristics of rainfall in India, rainfall intensity, measurement of rainfall by non-recording and recording type of rain gauges, method of computing average rainfall, recurrence interval.

3. SOIL EROSION

Mechanics, types and causes of erosion, factors affecting erosion, damages caused by soil erosion.

4. SOIL AND WATER CONSERVATION

Definition and aims of soil and water conservation in agriculture, soil conservation survey and land use capability classification, conservation farming.

5. AGRONOMIC MEASURES FOR SOIL & WATER CONSERVATION

Crop classification on the basis of soil conservation value, contour farming, mulching, strip cropping, cover cropping, mixed cropping, conservation crop rotation, ley farming, monoculture, role of grasses in soil conservation.

6. MECHANICAL METHODS OF EROSION CONTROL

Elementary idea of basin listing, sub-soiling, field bunding, contour bunding, graded bunding, ridge and channel terraces. Cost of narrow base broad base bund as earthwork and sadding cost.

7. CONSERVATION MEASURES FOR HILL SLOPES:

Contour trenching, specification of trenching, alignment and construction of trenches, bench terracing- types, construction and maintenance, elementary idea of stone terracing and its specification.

8. GULLY EROSION CONTROL & RECLAMATION:

Classification of gullies, principles of prevention and control of gullies by vegetative and mechanical measures, contour and peripheral bunding, ditches, gully plugging. Temporary and permanent structures: Earthen check dams, woven wire check dams, Brush dams, loose rock dams, log and

plank dams, straight drop spillway. Reclamation of gullies for cultivation.

9. FORESTRY MANAGEMENT IN SOIL CONSERVATION:

Effects of forests on soil and water conservation and climate, classification of forests, elementary idea of farm and social forestry, Taungya system and forest protection, selection, development, tillage, irrigation protection and management of nurseries, Bamboo Production Methods.

10. GRASSED WATERWAYS:

Use, design of waterways, grasses for waterways, construction of water ways, establishment of grasses on waterways, maintenance of waterways.

11. DRY FARMING:

Definition, climetic classification, elementary idea of various crop management & tillage practices. Land management practices in dry farming eg. sub-soiling and tied ridging. Water shed based soil and water conservation.

12 WATER CONSERVATION RESERVOIRS:

Types and uses of water conservation reservoirs, site selection & storage capacity of farm ponds, design principles of water harvesting bunds and structures, digging of ponds, construction and maintenance of water conservation structures.

13. FLOOD CONTROL:

Types of flood, damages caused by floods, elementary idea of head water flood control methods.

14. Land Grading & Land Levelling:

Water harvesting, Scope, need types, long term and short term water harvesting techniques, design of ponds.

15. Wind Erosion Control:

Principles, vegetative and mechanical practices.

16. Land reclamation

Classification of usar soils, salt resistant crops, reclamation of usar soils. Reclamation of waste lands forest lands and sandy soils, sanddunes stabilization.

17. Ravine reclamation:

Classification of ravines and various measures for ravine reclamation.

18. Command Area Development :

Advantage and disadvantages, Command area development, Component of C.A.D.A., Various C.A.D.A. programmes in India.

19. Vermi Compost From Cowdung & Agricultural Waste

PRACTICALS

1. Study of Rain gauges, their operation & installation.
2. Computation of average rainfall depth over an area by symous raigauge.
3. Study and use of float & currentmenter to measure runoff.
4. Demonstration of various types of soil erosion.
5. Preparation of land use capability map for a given area.
6. Survey and planning of soil counservation measures in a given area.
7. Cost estimation of bunding.
8. Cost estimation of levelling of a field with slope either lengthwise or breadthwise.
9. Cost estimation of digging of farm ponds of difinite dimensions.
10. Study of layout and management of forest nurseries.
11. Visit to various areas of soil-water couservation and land reclamation activities and structures.
12. Construction of Vermi compost pit and its operation.

6.4 R.C.C & STEEL STRUCTURES

L T P
6 - 4

RATIONALE:

Agricultural Engineering technicians has to construct farm houses, irrigation works and cattle shades etc. so he must have the knowldege of design of elementary steel structures and reinforced concrete works.

Contents of this subject have been develop in such a wayas to make them capable of supervising fabrication of steel structures and casting of R.C.works.

TOPICWISE DISTRIBUTION OF PEIRODS:

SL.NO.	TOPIC	L.	T.	P.
<hr/>				
(A)	STEEL STRUCTURES			
1.	Introduction	4		
2.	Structural connections	9		
3.	Tension members	6		
4.	Compression	6		
5.	Beams	6		
6.	Trusses	6		
7.	Bamboo Trusses	4		
(B)	R.C. STRUCTURES			
1.	Introduction	8		
2.	Singly reinforced beams and slabs	12		
3.	Doubly reinforced beams	6		
4.	T Beams	6		
5.	Column and column footing	6		
6.	Prestressing	5		
TOTAL		84	-	56

DETAILED CONTENTS:

(A) STEEL STRUCTURES

1. Introduction:

Importance, types of loads, structral steel, properties of structral steel, structural steel section, permissible stresses.

2. Structural Connections:
Types of structural connection, strength and design of riveted and welded joints for axially loaded members.
 3. Tension member
Common section used as tension member, strength of tension members.
 4. Compression member:
Common section used as compression member, strength of compression members (axially loaded columns & struts). Concept of lacing & battens.
 5. Beams:
Design criteria, allowable stresses.
 6. Roof Truss:
Types of trusses for different spans, roof coverings, supports, spacing, loads on trusses.
 7. Bamboo Trusses
- (B) Reinforced Concrete:
1. Introduction:
Behaviour and principles, assumptions in R.C. design, designation of concrete mixes, types and need of reinforcement, permissible stresses in concrete and steel, modular ratio, shear & bond stresses. Provision of shear and bond reinforcement. Concept of LIMIT DESIGN.
 2. Singly Reinforced Concrete Beam & slab:
Stress distribution, neutral axis, depth of neutral axis, tensile force, compressive force, lever arm, moment of resistance, actual & critical neutral axis. Types of singly reinforced beam, under, over and balanced sections, analysis of a given section, permissible stresses, design of a singly reinforced beam and slab.
 3. Doubly Reinforced Beam:
Importance of doubly reinforced beam, advantages and disadvantages of use of doubly reinforced beams.

4. T Beam

Concept, advantages, calculation of neutral axis, moment of resistance of T beam, reinforcement (no design).

5. Column and Column footing:

Types of column, effective length, different theories of design, lateral & transverse reinforcement, lateral ties, spiral/helical or hoop reinforcement, effective area of column, strength of short column, strength of column wounded by spirals, reduction factor. Concept of placement of steel in column footing.

6. Prestressing:

Definition, basic principle, advantages and disadvantages, method of prestressing, systems of prestressing (Methods only).

PRACTICAL

LIST OF EXPERIMENT:

1. To determine soundness of aggregates.
2. To determine specific gravity and water absorption of aggregates.
3. Comparative study of compressive strength of concrete for atleast 3 different mix under various curing periods.
4. Setting out of a building with two rooms and a varandah.
5. To determine cube strength of concrete.
6. To find slump of a given mix of concrete.

6.5 FARM & LAND DEVELOPMENT MACHINERY
(Including Agricultural Implements)

L T P
4 - 4

RATIONALE:

Supervisor of agriculture machinery at farms has to organise and supervise field operation. For doing this he needs to have understanding of the proper use of various machinery and have skill in their operation. Similarly in the workshop of Agro- industry and service centre farms he should have knowledge of repair and maintenance of equipments and machinery for supervisory work.

TOPIC WISE DISTRIBUTION OF PERIODS:

Sl. NO.	TOPIC	L.	T.	P.
1.	Farm Mechanization	3		
2.	Primary tillage	3		
3.	Secondary tillage	4		
4.	Sowing & Planting equipment	5		
5.	Interculture, weed control & Hand Hoes	3		
6.	Fertilizer equipment	3		
7.	Plant protection equipment	4		
8.	Harvesting equipment	4		
9.	Threshing equipment	5		
10.	Processing equipment	4		
11.	Land development equipment	6		
12.	Field capacity & efficiency	3		
13.	Economics, management and testing of farm equipment	3		
14.	Garden equipments	3		
15.	Rainsed Bed Preparation Equipment	3		
	TOTAL	56	-	56

DETAIL CONTENTS:

1. Farm Mechanization

Definition, status of farm mechanization in India, scope, limitations, advantages.

2. Primary Tillage Equipment:

i) Definition & Functions of tillage, tillage systems, types of tillage, Tillage implements.

ii) a. Mould Board Plough: Types of mould board plough, construction. Types of share, and Mould board and their material of construction, Concept of sunction, plough size, hitching of plough, point of bearing, Draft, side draft, unit draft, factors affecting draft, forces acting on plough. (Introduction only) Horse power requirements, and related numerical problems.

b. Disc Plough: Purpose, principles, types, construction and adjustment.

c. Other Plough: Chisel, subsurface, Rotary plough.

d. Ploughing: Concept of terms related with ploughing, Methods of Ploughing.

3. Secondary Tillage equipments:

a. Harrow: Types, construction and Adjustment repair and maintenance of Animal & tractor driven harrow.

b. Land Rollers Hackers & Pulveriser: Types construction and operation.

c. Rotavator and Puddlers

4. Sowing & Planting Equipment:

a. Pregerminated paddy seeder

b. Seed Drill/Seed cum Fertilizer Drill: Functions, Types, Construction, detail, size Metering devices, Furrow openers, seed covering devices Callibration of seed drill, and related numerical problems. Field adjustment, repair and maintenance & constructional details. Zero fill ferti drill, Fill plant machine, Strip fill drill Raised bed Planting Machine

c. Planters: Function, Types, Metering devices, Method of planting. Field advertisment, repair and maintenance. Potato Planter, Suger Cane Planter, Cotton, Misc. etc. Planter.

- d. Trans-Planter : Paddy transplanter (Manual and self propelled), Vegitable trans-planter.
5. Interculture and Weed Control Equipment:
 - a. Cultivator: Types, Construction, Attachments.
 - b. Rotary Hoe: Construction and working.
 - c. Flame Weed Control: Construction and working.
 6. Fertilizing Equipments:
 - a. Manure Spreaders: Construction and working.
 - b. Fertilizer Distributor: Construction and working.
 7. Plant Protection Equipment:

Types, principles of working, parts and material of constrion, fuction and adjustment of sprayer and duster, selection of plant protection equipment, field adjustment, repair and maintenance , safety precaution.
 8. Harvesting Equipments:
 - a. Mower, Windrower and Reaper Principle of cutting, types, construction working, adjustments, trouble shooting.
 - b. Combined Harvester : Types, Construction, Working, Material
 - c. Field Forage Harvestors: Types, working adjustment and flow path adjustment, maintenance.
 - d. Potato & Groundnut Digger: Construction and working.
 - e. Sugarcane Harvester: Construction and working.
 9. Threshing Equipments:

Types of threshers: Olpad thresher, Power wheat and paddy thresher, working principle, material, flow path, adjustment, repair and maintenance, trouble shooting and precaution.
 10. Processing Equipments:

Types, Construction and working of the following equipments: Chaff cutter, Sugercane crusher, Corn sheller, Potato grader and Winnower.

11. Land development Equipments:
Construction, operation/working and output of the following:
Dozer, Scraper, Power shovel, Drag hoe and Drag Line, scoop,
Land Laveller, Land Plane, Laser Land Plane.
12. Field Capacity & Efficiency:
Introduction, Concept about Field capacity & Efficiency.
13. Econoomics, Management and testing of farm equipments
 - a. Selection of farm machines and matching equipments of farm needs, break even point, Pay Back Period.
 - b. Calculation of cost of operation of farm-machines.
 - c. Field capacity & field efficiency.
 - d. Farm machinery testing in India. Details of catagory and field testing of few machines e.g. seed drill, thresher and plant protection equipments.
14. Garden Equipment :
Details of Garden & Halticultural equipments.
15. Rainsed Bed Preparation Equipment :
Use and utility of rainsed bed preparation equipment.

PRACTICALS

LIST OF EXPERIMENTS:

1. Identifying mould board and disc plough and their parts, assembling & dismantling, measurement of size, sections, angles, setting adjutment.
2. Hitching, field operation, adjustment and measurement of draft, line of pull etc. of a mould board plough.
3. Hitching, field operation and adjustment, measurement of

depth and width of ploughing with a disc plough.

4. Identifying harrow and cultivator and their parts, assembling and dismantling, angle setting, hitching, field operation and adjustments.
5. Identifying seed drills, seed cum fertiliser drill and planters and their parts, assembling and dismantling, setting and adjustments.
6. Calibration, field operation and adjustment of seed cum fertiliser drill.
7. Setting, field operation and adjustment of planter and transplanter.
8. Study of power sprayers and dusters different types of nozzles and calibration.
9. Field, operation, setting alignment, registration and other adjustments of a reaper and windrower.
10. Study of chaff cutter and sugarcane crusher.
11. Repair of farm equipment : Ploughs, harrows, Seed drills and weeding tools.
12. Visit of a mechanised farm for study of combine harvester. (Visit Only)
13. Operation of power thresher and safety aspects.
14. Study, sketch and operation of one of the following land development equipment through field visit:

Dozer, Scraper, Shovel, Drag hoe and Drag line

6.6 PROJECT

L	T	P
2	-	-

The project should be taken in close collaboration with the employing agencies. The project shall involve selection, analysis and solution of special problems related to farm implement, machinery and power/soil and water engineering/agricultural process engineering applicable to Indian conditions.

The project will be assigned to individual student or to a group of students not exceeding 5 as per problem.

Project will consist of:

- (a) Rural Development
- (b) Demonstration of new techniques for the cultivation of crops, operation of agricultural machinery power tiller and tractors.
- (c) Problem concerning to any one of the following:
 - To run his own workshop for repair and maintenance of agricultural implements.
 - Levelling and Irrigation-Drainage and soil-water conservation needs of farms.
 - To establish an agro based small scale rural industry.
 - Any other problem concerning agriculture.

At the end of the project student will submit a written report of his/ their accomplishment and face a viva voce examination individually.

- Note:
- (1) Project periods allotted in study scheme per week shall be provided in a stretch at the end of the session.
 - (2) Two different problems shall be framed by the head of department based on local needs and application in rural areas for technological advancement (approved by/ set by Board of Technical Education, U P, Lucknow).
 - (3) Devices for eliminating pollution and control must be included in the project.

STAFF REQUIREMENTS

THREE YEARS (SIX SEMESTER) DIPLOMA IN AGRICULTURAL ENGG.

Sl.No. Required	Designation	Load/Week	No.
1.	Principle		one
2.	Head of department	12	one
3. Time	Lecturer in Tech. Communication	3	Part
4. Time	Lecturer in Mathematics	5	Part
5 Time	Lecturer in Applied Physics	6	Part
6. Time	Lecturer in Applied Chemistry	4	Part
7. Time	Lecturer in Computer Engg.	4	Part
8. Time	Lecturer in Electrical Engg.	4	Part
9.	Lecturer in Mechanical Engg.	23	one
10.	Lecturer in Civil Engg.	22	one
11.	Lecturer in Agricultural Engg.		
	(a) Specialization in farm power & post harvest tech.	21	one
	(b) Specialization in soil, Irrigation and drainage Engg.	20	one
12.	Workshop suptd.		one
13.	Workshops Instructors		6
14.	Supporting staff for 14 labs		
15.	Lab Asst.(one for two labs)		7

SPACE STRUCTURE
[A] ADMINISTRATIVE BLOCK

Sl. No.	Details of Space	Floor Area Sq. metres	Remark
1.	Principal's Room	30	
2.	Confidential Room	10	
3.	Steno's Room	6	
4.	Office including Drawing Office	80	
5.	Staff Room (a) Head (b) Lecturer 10 sq.m./ Lect.	15	
6.	Library and Reading room	150	
7.	Store	100	
8.	Students Common room	80	
9.	Model Room	90	

[B] Academic Block

Si.No.	Detail of Space	No.	@ Sq.m	Floor Area Sq.m.
1.	Class Room	3	60	180
2.	Drawing Hall	1	120	120
3.	Physics Lab			75
4.	Chemistry Lab			120
5.	Mechanics & S.O.M Lab			120
6.	Survey Lab			40
7.	Civil Lab I			75
8.	Hydraulics and Irrigation Engg. Lab Over Head Tank 2000 Litre Cap; Under Ground Tank 600 Litre Cap;			120
9.	Agri. Science, Rural & Entp. Dev. Lab			75
10.	Electrical Engg. & Rural Elect. Lab			100
11.	Soil Mech. & Soil Science Lab			75
12.	Form Power Engg. Lab			120

13.	Post Harvest & Agro Based Ind. Lab	120
14.	Soil & water Conservation Lab	120
15.	Farm & Land Development Machinery Shop	180
16	Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling)	60

[C] Work shop

I	Workshop Supdt. Room	20
II	Store	20
III	Shops	
(a)	Carpentry Shop	50
(b)	Smithy Shop	50
(c)	Fitting Shop	50
(d)	Welding Shop	50
(e)	Painting Shop	50
(f)	Sheet Metal ,Soldering & Brazinf shop	50
(g)	Plumbing shop	50
(h)	Machine Shop	150

[D] Student's Aminties

1.	Hostel	40 %	of Strength of Students
2.	Cycle Stand	50 %	of Strength of Students
3.	Canteen and Tuck shop	50	
4.	N.C.C. Room	70	
5.	Dispensary	40	
6.	Guest Room(Attached Bath)	30	

[E] STAFF RESIDENCES

1.	Principal	1	100	100
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2.	Head od Department	1	100	100
3.	Lecturer/Workshop Supdt.	5	80	400
4.	Non teaching & Supporting staff	8	60	480
5.	Class IV	5	30	150

SPACE STRUCTURE

[A] ADMINISTRATIVE BLOCK

Sl. No.	Details of Space	Floor Area Sq. metres	Remark
1.	Principal's Room	30	
2.	Confidential Room	10	
3.	Steno's Room	6	
4.(a)	Office including Drawing Office	80	
(b)	Record Room	20	
5.	Staff Room		
	(a) Head 1	15	
	(b) Lecturer 10 sq.m./ Lect. for 8 Lecturers	80	
6.	Library and Reading room	150	
7.	Store	100	
8.	Students Common room	80	
9.	Model Room	90	

[B] Academic Block

Sl.No.	Detail of Space	No.	@ Sq.m	Floor Area Sq.m.
1.	Class Room	2	75	150
2.	Drawing Hall	1	120	120
3.	Physics Lab			75
4.	Chemistry Lab			120
5.	Mechanics & S.O.M Lab			120
6.	Survey Lab			40
7.	Civil Lab I			75
8.	P.H.E. Lab			75
9.	Highway Engg. Lab.			75
	Hydraulics and Irrigation Engg. Lab			120
	Over Head Tank 2000 Litre Cap;			
	Under Ground Tank 600 Litre Cap;			
10	Computer Lab (Air Cond.Glass Partition and Special type pvc flooring and false ceiling)			60

[C] Work shop

I	Workshop Supdt. Room	12
II	Store	20
III	Shops	
(a)	Carpentry Shop	50
(b)	Smithy Shop	70
(c)	Fitting Shop	50

(d) Welding Shop	50
(e) Painting Shop	50
(f) Sheet Metal ,Soldering & Brazing shop	50
(g) Plumbing shop	50
(h) Machine Shop	150
(i) Foundry	75

[D] Student's Amenities

1. Hostel	40	%	of Strength of Students
2. Cycle Stand	50	%	of Strength of Students
3. Canteen and Tuck shop	50		
4. N.C.C. Room	70		
5. Dispensary	40		
6. Guest Room(Attached Bath) including kitchen & store	45		

[E] STAFF RESIDENCES

1. Principal	1	100	100
2. Head of Department	1	100	100
3. Lecturer	4	80	320
4. Non teaching & Supporting staff	8	60	480
5. Class IV	6	30	180

Priority to be given in following order

- (1)
 - a. Administrative Building
 - b. Labs
 - c. Workshop
 - d. Over head Tank
 - e. Boundary Wall
 - f. Principal Residence
 - g. Fourth Class Quarters (2/3)

- (2)
 - a. Hostel
 - b. Students Amenities

- (3)
 - Residences of employee

LIST OF EQUIPMENTS

Only those of the equipments given below which are essentially required for the conduction of practicals mentioned in the curriculum are to be procured by the institutions.

"Machine/Equipments/Instruments of old BTE list which are not included below are to be retained in the Lab/Shop for Demonstration purpose but not to be demanded fresh for purchase."

NOTE : Equipment for different shop and lab of latest version should be purchased.

I. APPLIED PHYSICS LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Brass ball with hook dia 1.8 Cm to 2 Cm diameter	2	50	100
2.	Stop watch least count Least Count 0.1 Sec. (non-magnetic) 0.01 sec to 0.001 sec (Electronic Desirable)	4	750	3000
3.	Wall bracket with clamping arrangement 8" to 10" length	2	50	100
4.	Meter scale Least count 0.1cm, wooden 1meter	5	40	200
5.	Meter scale Least count 0.1cm, wooden 50 Cm	5	40	200
6.	Searl's conductivity apparatus with copper & steel rods 25 cm length 4 cm. diameter with all accessories	2 set	1500	3000
7.	Constant Level Water Flow Container of one liter capacity vertical stand & rubber tubing	2	250	500
8.	Thermometer 0-110°C (Least count 0.1°C desirable)	4	100	400
9.	Potentiometer - 10 wires (1 meter length of each wire) with jockey, sunmoical top	4	750	3000
10.	Moving coil galvanometer 30-0-30 with moving mounting	5	300	1500
11.	Rheostat 50 ohm., 100 Ohm., 150 Ohm. 16 capacity	16	300	4800
12.	Lead Accumulator 2V, 6V (1 No. Each)	2	250	500
13.	Meterbridge 1 meter length, sunmica top copper strips fitted with scale	2	300	600
14.	Resistance Coil (Standard) 1 ohm. to 10 ohm.	10	50	500
15.	Moving coil ammeter 0-1 amp., 0-2 amp., 0-5 amp. with mounting	8	250	2000
16.	Moving coil voltmeter 0-1 V., 0-2V 0-5 V., 0-10 V. with mounting	8	250	2000
17.	Denial cell with complete accessories	2	250	500

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
18.	Leclanche Cell with complete accessories	2	250	500
19.	Standard Cadmium Cell with complete accessories	2	250	500
20.	Battery Charger with complete accessories	1set	1800	1800
21.	Battery Eliminator Multi range	2set	750	1500
22.	Multimeter(Digital)	1set	800	800
23.	Carey Foster Bridge (With all accessories)	2set	4500	9000
24.	Resistance Box (2 No. Each) 0-1 Ohm, 0-100 Ohm.	4	850	3400
25.	Fractional Resistance Box 0-1 Ohm.	2	1200	2400
26.	Post office box Key type	2	1200	2400
27.	Post office box Dial type	2	1200	2400
28.	Resistance Wire(100 Gm.) (Constanton/Maganin)	1 lacchi	100	100
29.	Connecting Wire Copper(1/2 Kg.) (Cotton Insulated)	1 lacchi	700	700
30.	Screw gauge L.c 1/100 mm	5set	150	750
31.	Vernier Callipers L.c. 1/10 mm	5set	100	500
32.	Appratus for determining character- stics of P-N junction diode complete with all accessaries	2 set	1500	3000
33.	Resonance Column of steel One Meter length and 3-4 Cm diameter fitted with scale & water level arrangement	2	1600	3200
34.	App. for determining coefficient of friction on a horrizontal plane (Complete with all accessories)	2 set	700	1400
35.	Tuning Fork's Sets Set of different frequency (with rubber pad)	3set	350	1050
36.	Physical balance with weight box Complete with Fractional weight	2	800	1600
37.	Anemometer with counter cup type	1	1000	1000
38.	Spring Force Constant Apparatus with graduated mirror & pointer, weight set with hanger	2	1200	2400
39.	Viscosity Apparatus (Stock law) with steel balls and viscous liquid & timer	2set	1600	3200
40.	Thermometer of different range Mercury thermometer 0-50oC to 0-110oC	10set	100	1000
41.	Wall Thermometer Alcohol Filled 0-50oC	2set	20	40
42.	Sprit Level Technical Type	1set	60	60
43.	Drilling Machine Electric with different size bits	1set	800	800
44.	LPG Gas Burner with Cylinder	1set	800	800
45.	Tool Kit with different tools Complete	1set	800	800
46.	Lab stools	30		

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
47.	Lab tables	8		
48.	Plug Keys One Way	5	50	250
49.	Plug Keys Two Way	5	100	500
50	Helical Springs - Soft, 10 cm each	6	100	600

II. APPLIED CHEMISTRY LAB

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
1.	Test tube stand (Plastic/Tafflon)	30	20	600
2.	Funnel stand (Plastic/Tafflon)	30	20	600
3.	Burette stand Stainless Steel/Wooden/Iron	30	50	1500
4.	Pipette stand Stainless Steel/Wooden/Plastic	30	20	600
5.	Chemical balances with analytical weights 1gm -200gms	5	1500	7500
6.	Fractional weights set with rider 10 mg to 500 mg with rider	5sets	25	125
7.	Kipp's apparatus 1000 ml. Plastic/ Tafflon	2	500	1000
8.	Reagents bottles			
	250ml	120	20	2400
	500ml	25	25	625
	1000ml	5	30	150
9.	Wide mouth bottle 250 ml Glass	50	15	750
10.	Winchester bottle 2.5 litre Plastic/Tafflon	15	30	450
11.	Test tubes 1/4" x 6"			
	i. Corning or Borosil	200	9	1800
	ii. Glass	200	2	400
12.	Boiling tube 1" x 6"			
	i. Corning or Borosil	100	16	1600
	ii. Glass	100	5	500
13.	Pestle and mortar Dia 10 cms 15 cms (Ceramics)	2	30	60
14.	Watch glass 5.0 cms, 7.5 cms glass	15	5	75
15.	Beakers (Glass/Brosil/Corning Plastic)			
	250 ml.	50	20	1000
	500 ml.	50	20	1000
16.	Weighing Tube 10 ml with lid (Plastic)	30	10	300
17.	Wash bottles (Plastic/Tafflon)	30	15	450
18.	Conical flask 250 ml. Glass (Brosil/Corning/Plastic) Transparnt	100	30	3000
19.	Flat bottom flask 500 ml. Glass	15	40	600
20.	Flat bottom flask 250 ml. Glass	15	25	375
21.	Burette 50 ml. (Plastic/Tafflon)	30	60	1800
22.	Pipette 25 ml. (Plastic/Tafflon)	30	20	600
23.	Measuring flask 250 ml. with stopper	30	50	1500
24.	Measring cylinder of various sizes (100 ml, 250 ml, 500 ml, 1000 ml) 3 no. of each	12	30	360
25.	Bunsen's burner of brass	30	50	1500
26.	Gas plant petrol/LPG 10 to 20 burners automatic	1	5000	5000
27.	Spirit lamp (Brass)	30	30	900
28.	Tripod stand (Steel/Iron) Large/Medium	30	30	900
29.	Wire gauge 15 X 15 cm. with asbestos	30	15	450
30.	Test tube holder wodden	50	10	500

S.No.	Name of Equipment	No.	@ Rs. Aprox.	Amt.in Rs. Aprox.
31.	Porcelain plates Ceramic	30	20	600
32.	Funnel 15 cm. Glass Borosil Corning/Plastic	60	16	960
33.	Spatula hard & nickel/steel	2 each	50	100
34.	Distilled water units (electrical)	1	10000	10000
35.	Distilled water units (solar)	1	5000	5000
36.	Open balance 1000 gms./10 mg.	1	600	600
37.	Brush for cleaning Hydro Fiber Acid & Alkali Resistant	100	10	1000
38.	Jars 20 Lit. for keeping distilled water	5	100	500
39.	Lab table 2 m. x 1.2 m. x 1 m. hight with central sink and cup boards (Teak wood) with drawers and two built in almirah on each side with reagent racks, better tile top	4	8000	32000
40.	Exhaust fans 18" (GEC make/Crompton)	4	2000	8000
41.	Side racks and selves for bench reagents made of teak wood for 24 bottels each set	4	2000	8000
42.	Digital balance electronic Electronics upto 2 decimal places	1	10000	10000
43.	Hot plates 7-1/2", 3" dia controled 2000 watts	1	1000	1000
44.	Hot air oven thermostatically controled with selves and rotary switches 350 x 350 x 25 high	1	8000	8000
45.	pH Meter (Digital)	1	1000	1000
46.	Glass Electrode	2	850	1700
47.	Reference Electro	2	850	1700
48.	Weight Box 1gm, 2gmX2, 5gm, 10 gm 20gmX2, 50gm, 100gm with for cep Miscellaneous	LS		15000

III. APPLIED MECHANICS LAB

Sl.No.	Name of Equipment	No.	Rate	Amount
1.	Polygon of Forces Apparatus	4	1500	60000
2.	Universal Force Table	2	2500	5000
3.	Principle of Moment Apparatus Bell Crank lever	4	1500	60000
4.	Combined Inclined plane & Friction apparatus	4	1500	60000
5.	Simple wheel and axle	2	2500	5000
6.	Differential wheel and axle	2	3500	7000
7.	Double sleeve Pulley Block	1	800	800
8.	Simple Screw Jack	4	3000	12000
9.	System of pulleys (Any I,II,III)	2Set Each	4000	8000
10.	Worm & Worm wheel	2Set Each	5000	10000
11.	Simply Support Beam with different weights (2 Sets)	2	3000	6000
12.	Jib Crane	2	2500	5000
13.	Jointed Roof Truss Apparatus	2	2500	5000
	Misc.	Lum Sum		5000

Note :

1. S. No. 1,2 Acrylic/Wood material/Aluminium Cast
2. S.No. 3,4,5,8,9 working model of Acrylic/Aluminium/Cast
3. Above items are for 2 batches of 15 students each.

V. WORKSHOP PRACTICE

CARPENTRY SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	60 cm.rule	10	50	500
2.	Flexible steel rule 2 metre	2	75	150
3.	T square 23 cm. steel	10	50	500
4.	Bevel square 23 cm. steel	2	100	200
5.	Marking knife 25 cm. steel	10	100	1000
6.	Marking gauge wooden & brass 25 cm.	10	150	1500
7.	Mortise gauge wooden & brass 25 cm.	10	150	1500
8.	Caliper inside, steel 20 cm.	2	200	400
9.	Caliper outside , steel 20 cm.	2	200	400
10.	Compass steel 20cm.	2	100	200
11.	Deviver steel 20 cm.	2	100	200
12.	Plumb	2	75	150
13.	Wooden bench vice steel 20 cm.	10	500	5000
14.	Bench hold fast steel 30 cm.	10	300	3000
15.	Bar clamp 2 m.	2	500	1000
16.	G clamp of flat spring steel 20x30 cm.	4	150	600
17.	Rip saw 40-45 cm.	10	200	2000
18.	Cross cut saw 40-45 cm.	2	200	400
19.	Tennon saw 30-35 cm.	10	200	2000
20.	Dovetail saw 30-35 cm.	2	150	300
21.	Compass saw 35 cm.	4	150	600
22.	Key hole saw or pad saw 30-35 cm.	2	150	300
23.	Bow saw	2	200	400
24.	Frame saw	2	200	400
25.	Chisel fish brand 1" to 1/8" firmer	3 set	250	750
	Dovetail	3 set	250	750
	Mortise	3 set	250	750
26.	Gauge or Golchi 1" to 1/8"	3 set	300	900
27.	Wooden jack plane complete	10	100	1000
28.	Wooden smoothing plane	10	250	2500
29.	Iron jack plane complete	10	200	2000
30.	Iron rebate plane complete	3	200	600
31.	Iron grooving plane complete	3	300	900
32.	Iron compass plane complete	3	350	1050
33.	Wooden moulding plane complete	3	500	1500
34.	Bradawl	3	350	1050
35.	Gimlet drills set	1 set	300	300
36.	Center bit	2	250	500
37.	Twist bit	2	200	400
38.	Auger bit	2	200	400
39.	Dovetail bit	2	200	400
40.	Counter shank bit	2	200	400
41.	Ratchet brace machine	2	300	600
42.	Grand drill machine 1/4"	2	600	1200
43.	Wooden hand drill burmi	5	700	3500
44.	Wooden mallet	10	100	1000
45.	Claw hammer	3	100	300
46.	Carpenters hammer	10	100	1000
47.	Cutting tool for Universal wood working machine	3 set	1500	4500
48.	Screw driver 18" & 15"	6	100	600

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
49.	Adze 500 gm.	10	100	1000
50.	Pincer 175 mm.	6	250	1500
51.	Plier 150 mm.	4	200	800
52.	Oil stone 8"	4	180	720
53.	Rasp file 12"	4	200	800
54.	Half round file 12"	4	200	800
55.	Round file 12"	4	200	800
56.	Triangular file 5", 4"	8	200	1600
57.	Water stone	4	80	320
58.	Carpentry work benches	4	4000	16000
59.	Band saw machine complete	1	60000	60000
60.	Circular saw machine	1	35000	35000
61.	Double Ended Electric Bench grinder	1	15000	15000
62.	Universal wood working machine	1	30000	30000
	misc. for foundation of machines	LS		20000
SMITHY SHOP				
1.	Anvil 150 Kg. with stand	5	5500	25500
2.	Swage block 50x30x8cm.&45x45x10cm.	2	3000	6000
3.	Hammers			
	Ball peen 0.8 Kg. (Approx.)	10	350	3500
	Cross peen 0.8 Kg. (Approx.)	10	350	3500
4.	Beak iron 25 Kg.	1	1000	1000
5.	Swages different types	6	100	600
6.	Fullers different types	6	100	600
7.	Leg vice 15 cms. opening	1	300	300
8.	Electric blower with motor	1	10000	10000
9.	Furnace chimney with exhaust pipe	5	10000	50000
10.	Sledge hammer - 5 Kg.	2	400	800
	Misc. tools		LS	5000
SHEET METAL, SOLDERING & BRAZING				
1.	Dividers - 15cm.	5	100	500
2.	Trammel 1 m.	1	80	80
3.	Angle protector	5	100	500
4.	Try square 30 cm.	5	80	400
5.	Centre punch	5	50	250
6.	Steel rule 30 cm. , 60 cm.,	5	25	125
7.	Sheet metal gauge	1	250	250
8.	Straight snips 30 cm.	2	500	1000
9.	Curved snips 30 cm.	2	600	1200
10.	Bench shear cutter 40 cm.	1	10000	10000
11.	Chisel 10 cm.	5	200	1000
12.	Hammer	5	300	1500
13.	Bench vice 13 cm.	5	2000	10000
14.	Plier	5	100	500
15.	Nose plier	5	120	600
16.	Sheet metal anvil/stakes	5	3500	17500
17.	Shearing machine 120 cm.	1	5000	5000
18.	Solder electric	2	1000	2000
19.	Solder furnace type	2	500	1000
20.	Brazing equipments and accessories	1	10000	10000
21.	Blow lamp	2	400	800
22.	Sheet bending machine	1	20000	20000
	Misc.		LS	10000

FITTING SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Bench vice jaw 10 cm.	10	600	6000
2.	Surface plate 45x45 cm.	2	4500	9000
3.	V. Block 10x7x4 cm.	5	700	3500
4.	Try square	10	100	1000
5.	Bevel protractor 30 cm.	1	250	250
6.	Combination set	1	3000	3000
7.	Divider	5	100	500
8.	Centre punch	5	80	400
9.	Calipers (Different sizes)	12	100	1200
10.	Vernier calipers 30 cm.	2	1500	3000
11.	Micrometer 0-25, 25-50 m.m.	4	1500	6000
12.	Vernier depth gauge	1	700	700
13.	Feeler gauge--15 blades	1	100	100
14.	Radius gauge	1	200	200
15.	Angle gauge	1	200	200
16.	Thread gauge	1	200	200
17.	Bench drilling machine 13 mm.	1	10000	10000
18.	Double ended electric grinder	1	8000	8000
19.	Drill set	1set	2000	2000
20.	Reamer set	1set	3500	3500
21.	Tap set	1set	3500	3500
22.	Adjustable wrenches (15 cm., 20cm. 30 cm.)	1set	1200	1200
23.	Allen key set	1set	700	700
24.	Spanners	6	100	600
25.	Work benches	6	4500	27500
26.	Power hacksaw	1	8000	8000
	Misc. Files, Dieset, Hexa frames etc.		LS	20000

WELDING SHOP

1.	Ellectric welding set oil cooled	1	20000	20000
2.	Industrial regulator type oil cooled arc welder	1	25000	25000
3.	Air cooled spot welder 7.5 KVA	1	30000	30000
4.	General accssories for air cooled spot welder of 7.5 KVA			15000
5.	Gas welding set with gas cutting torch and complete with all accessories	1	30000	30000
6.	Misc. work benches		LS	35000

PAINTING & POLISHING SHOP

1.	Air compressor complete with 2 HP motor	1set	25000	25000
2.	Spray gun with hose pipe	1	1500	1500
3.	Stoving oven	1	6000	6000
4.	Buffing machine with leather and cotton wheels	1	8000	8000
5.	Electroplating Equipment for cromium Nikle plating.	1	20000	20000
	Misc.		LS	5000

PLUMBING SHOP

S.No.	Name of Equipment	No.	@ Rs.	Amt.in Rs.
1.	Pipe vice 5 cm.	4	500	2000
2.	Chain wrenches	5	500	2500
3.	Ring spanner Set	5	250	1250
4.	Wheel pipe cutter	2	600	1200
5.	Water pump plier	4	100	400
6.	Pipe die set 2" set	2	set1200	2400
7.	Pipe bending device	1	5000	5000
8.	Work benches	4	6500	26000
9.	Set of various types of plumbing fittings e.g. Bib cock, Cistern, Stop cock, Wheel volve, Gat volve etc.		LS	4000
10.	Misc. Hacksaw frame and others		LS	4000

FOUNDRY SHOP

1.	Moulding boxes	25		12000
2.	Laddles	5		2000
3.	Tool kits	10	sets	5000
4.	Quenching tanks water or oil	2		2000
5.	Permiability tester	1		2000
6.	Mould hardness tester	1		12000
7.	Sand tensile testing equipment	1		15000
8.	Portable grinders	1		6000
9.	Temperature recorders/controllers	LS		10000
10.	Pit furnace with Blower	1		10000

MACHINE SHOP

1.	Lathe machine 4.5 feet "V" bed. Height of centres 8.5 inch. Dog chuck 8 inch complete 1 H.P. motor 440v, push button starter with coolent pump, tray and with standard accessories.	4		50000
2.	Shaper machine 12 inch stroke with 2 H.P. motor 440 volts push button starter with vice 6 inch (Swivel base)	2	20000	200000

NOTE:-

- The institutes running mechanical engg. course need not purchase these two items sepreately because they will have one complete machine shop for the course
- Above items are for 2 batches of 15 students each.

Additional Equipments For Second Year Mechanical Engg. Only)

1.	Crucibles (10-20 Kg.)	1	5000	5000
2.	Core Boxes	1 Set	8000	8000
3.	Plate form Weighing M/C (100 Kg. Capacity)	1	15000	15000
4.	Drying Oven	1	30000	30000
5.	Sand Sieves	1 Set	1000	1000
6.	Optical Pyrometer	1	10000	10000
7.	Electrical Discharge M/C (EDM)	1	50000	50000
8.	Misc.	LS		5000

Note:

1. Above items are for 2 batches of 15 students each.

FARM STRUCTURES MATERIALS AND CONSTRUCTION LAB

Sl.No.	Equipment with brief specification	No.	Rate	Amount
1.	Kit of stone specimens containing at least 10 types of commonly used stones	1	1000	1000
2.	Kit of specimens of timber containing at least 10 types of commonly used timbers	2	1000	2000
3.	Vicat needle apparatus with all accessories	2set	1000	2000
4.	Apparatus for determining Specific gravity of cement	1set	2600	2600
5.	Air Permeability Apparatus Blains type for finness of cement	1set	1600	1600
6.	Compression Testing Machine 200 Tonnes Capacity with pumping unit Ellectically and manually operated	1set	70000	70000
7.	Model of bricks made of timber (8cm*4cm*4cm) containing queen closer, King closer, half and 3/4 brick bats set of 1000 bricks packed in a wooden box	2set	3000	3000
8.	Electric Oven with thermostat arrangement	1	5000	5000
9.	Single Pan Balance 10 Kg capacity with set of weight .1kg to 10 Kg & weight box for fractional weights,	1set	2000	2000
10.	Picnometer 900ml capcity	2	250	500
11.	Slump Cone Apparatus complete with all accessories and base plate	2set	1000	2000
12.	Bar bending table with all accessories	1set	1000	1000
13.	Steel tape 30 meter	5	200	1000
14.	Mettalic tape 30m,20m,and 10m 2 nos of each size	6	100	600
15.	Misc. for scales, jars, weights beakers, measuring cylinders, enamel plates, sample containers etc.	Lum sum		5000

AGRICULTURAL SCIENCE LAB

1. Specimen of crop and vegetable seed placed in a wooden box and properly levelled. (10 types of each)	2 sets	500	1000
2. Specimen of different types of fertilizers kept in a wooden box and properly levelled. (10 types)	2 sets	500	1000
3. Specimens of various types of Insecticides, fungicides and weedicides kept in a wooden box properly levelled. (4 types of each)	2 sets	500	1000
4. Seed Treatment Machine with all accessories.	1 no.	10000	10000
5. Plastic Containers (Transparent)			
250 ml.	50	5	250
500 ml.	30	10	300
1000 ml.	20	15	300
6. Packer	1	1500	1500
7. Roller wooden	1	1000	1000
8. Hoe (Different types)	Two sets	500	1000
9. Patela wooden	2	500	1000
10. Pruning Knife	10	150	1500
11. Secateurs	10	200	2000
12. Budding & grafting knife	10	200	2000
13. Footoperated sprayer and duster hand operated	1 each	2500	25000
14. Miscellaneous (Kudal, Khurpi, spade, garden scissors, hazara and gamla, patri dishes, pvc pipe etc)		LumSum	10000

M.O.S. & HYDRAULICS LAB

1. Universal Testing Machine of 40 T Capacity with changeable load scale to 4t,20t & 40 T.	1	400000	400000
2. Simply supported beam apparatus for determination of shear force	1	1000	1000
3. Simply supported beam apparatus for determining bending moment	1	1000	1000
4. Steel beam apparatus to determine E by method of deflection for different loading condition	1set	1000	1000
5. Brinel Rockwell Hardness Tester with all accessories complete	1set	15000	15000
6. Tortion Testing Apparatus complete with all accessories	1	2000	2000
7. Bernaulli's Theorem Apparatus with ball accessories and collecting tank	1set	4500	4500
8. Venturimeter Apparatus with all accessories, pipefittings and storage tank	1set	12000	12000
9. Apparatus for determining coef. of velocity, Coef. of contraction and coef. of discharge of an orifice	1set	12000	12000
10. Reynold's apparatus for determining critical velocity and Reynold's number.	1set	8000	8000
11 Apparatus for determining Darcy's Coef. of friction in pipes.	1set	8000	8000
12 Apparatus for determining losses due to sudden enlargement and sudden contraction.	1set	8000	8000
13. Current meter	1	5000	5000
14, Notch Apparatus with discharge tank, set of notches and other supporting structure	1set	9000	9000
15. Sectional model of the following:			
i. Reciprocating pump	1	2000	2000
ii. Centrifugal pump	1	2000	2000
iii. Impulse Turbine	1	2000	2000
iv. Reaction Turbine	1	2000	2000
16. Misc. equipments, pipe fitting, storage tank & overhead tank for hydraulcs lab and misc. tool and other acessories L.S.			15000

SURVEY LAB.

1. Vernier Theodolite	2	10000	20000
2. Dumpy Level	4	1500	6000
3. I.O.P. Level	4	2000	8000
4. , Surveyer's Compass	2	600	1200
5. Box Sextant	1	1200	1200
6, Abney's Level	10	200	2000
7. Clinometer	2	600	1200
8. Optical Square	2	200	400
9. Folding Staff	2	900	1800
10. Telescopic Staff	10	1000	10000
11. Plane Table with all accessories	4	1200	4800
12, Meteric Chain 20m & 30m	10	240	2400
13. Steel Tap 30m	2	150	300

14.	Mettalic Tap	20m	10	100	1000
15.	Steel Band		1	500	500
16.	Cross Staff		2	50	100
17.	Penta Graph		2	1000	2000
18.	Planimeter		1	750	750
19.	Telescopic Alidade		1	1500	1500
20.	Ranging Rod steel conduit	2m	50	60	3000
21.	line Ranger		1	250	250
22.	Prismatic Compass		5	500	2500
23.	Quick set Level		1	2500	2500
24.	Cylone Ghat Tracer		1	800	800
25.	Boning rod set		1 set	400	400
26.	Invar Tap		1	750	750
27.	Engineers , Revenue and Gunter's Chain one each		3	150	450
28.	Scientific Calculator		2	750	1500
29.	Misc.		L.S.		10000

SOIL MECHENICS AND SOIL SCIENCES LAB

1.	Direct Shear Box Apparatus Complete with all accessories		1	10000	10000
2.	Permometer (Constant and Variable head)		1set	8000	8000
3.	Standard Procter Compaction Test Apparatus with all accessories		1set	1000,	1000
4.	Split Spoon Sampler		1	800	800
5.	Thin Walled Sampler		1	500	500
6.	Hydrometer with 1000ml. jar		1 set	100	100
7.	Liquid Limit Apparatus With revolution counter and other accessories complete		2 set	500	1000
8.	Set of BIS standard Sieve		1 set	4000	4000
9.	Sieve Shaker Electrically operated		1	4000	4000
10.	Oven electrically operated medium		1	5000	5000
11.	Sample Extracter		1	500	500
12.	Core Cutter apparatus for determining field density of soil		1 set	2000	2000
13.	Sand Replacement Apparatus for determining field density of soil		1 set	2500	2500
14.	Triple Beam Balance				
	3 Kg. Cap.& .1 Kg Accuracy		1	800,	800
	1 Kg, Cap, & 0.1 Kg Accuracy		2	500	1000
15.	Single Pan Balance 5Kg Cap.		1	750	750
	1 Kg. Cap		1	600	600
16.	Physical Balance with weight box.		1	1000	1000
17.	Dial Gauge .01 least count		1	1000	1000
18.	Plateform Weighing Machine	100 Kg.	1	6000	6000
19.	Capillary Test Apparatus		1	500	500
20.	pH meter		1	5000	5000
21.	Tenso meter		1	2000	2000
22.	Post hole and helical auger hand operated three sets of each		6sets	1000	6000
23.	Alluminum Sample Container with lid		20	5	100
24.	Misc. for minor equipment , tools glass ware, heating and storing vessels etc.		L.S.		10000

ELECTRICAL ENGINEERING AND RURAL ELECTRIFICATION LAB

1.	Three point starter		8	3000	24000
2.	Ammeter A.C. and D.C. 4no each		8	600	4800
3.	Voltmeter A.C. and D.C. 4 no. each		8	600	4800
4.	Single phase transformer		2	3000	6000

5. Rheostat of different values	10	200	2000
6. Wattmeter	5	500	2500
7. Energy meter	5	600	3000
8. Earth Tester	1	4000	4000
9. Power Factor meter	1	6000	6000
10. Star Delta Starter	4	2000	8000
11. Speedometer	1	4000	4000
12. Moter A.C. 5 HP	2	5000	10000
13. Moter D.C. 5 HP	2	5000	10000
14. Alternator	1	10000	10000
15. Connecting wires and accessories		L.S.	5000
16. Cables and cable fittings		L.S.	10000
17. Wooden Board and switches etc.		L.S.	5000
Miscellaneous		L.S.	10000

RURAL AND ENTREPRENEURSHIP DEVELOPMENT LAB

1. Colour T.V.	1	20000	20000
2. C.D. Player	1	5000	5000
3. Portable Generater Set	1	25000	25000
4. Camp furniture		L.S.	20000
5. Dari and bed sheets etc.	10 set	L.S.	5000
6. Ring Toss Game Kit	1set	500	500
7. Tower Building Game Kit	1set	400	400
8. Boat making Papers	10set	300	300
9. Broken Squqres	1set	250	250
10. Trainer's Manual	1set	250	250
11. Tent		8000	8000
Misc.		Lum Sum	5000

FARM POWER ENGINEERING WORKSHOP

1. Tractor with full accessories 35 BHP	1	3,50,000	
2. Solar Pump	1	10,000	
3. Motercycle complete engine(second hand)	1	8,000	
4. Various Types of Carburator	1set	8,000	
5. Diesel Pump Set complete (Slow speed)	1	10,000	
(High speed)	1	10,000	
6. High Tention Battery	1	5,500	
7. Spark Plug Tester	1	4,500	
8. Old Diesel Vehicle Complete (need not in working order)	1	40,000	
9. Power Tiller with full attachments	1	2,00,000	
10. Tractor Trailer Cap. 3 Tonnes	1	35,000	
11. Air Compresor with pipe hose & 3 HP Motor with Car washer jet & Tele hoist	1.	80,000	
12. High Pressure Water Pump for servicing of vehicle .	1	8,000	
13. Gobar Gas Plant and Installation expences (Model)	1 set	4,000	
14. Solar Collector flat plate	1	5,000	
15. Solar Cooker, Solar crop drier & solar water heater	L.S.	75,000	
16. Cut section and working Models of form power equipments	L.S.	20,000	
17. Misc. for meters, scales, storage and other common assorted materials	L.S.	10,000	

POST HARVEST TECHNOLOGY AND AGRO BASED INDUSTRY LAB

1. Air Screen Cleaner Farm Model two sieve with motor complete.	1	10000	10000
2. Elevator (Conveyer belt type)	1	25000	25000
3. Heated Air Drier	1	50000	50000
4. Screw conveyer with motor	1	20000	20000
5. Bucket elevator with motor	1	20000	20000
6. Slurry seed treator with motor	1	15000	15000
7. Dal Mill (mini unit) rubber role type for demonstration	1	20000	20000
8. Rice Mill (Mini unit) with 5 HP motor complete	1	60000	60000
9. Model of cold storage (Mini Plant)	1	25000	25000
10. Various types of grain bins	1set	8000	8000
11. Oil expeller 1/2 Qnt/hour capacity	1	30000	30000
12. Ground nut decorticator	1	3000	3000
13. Potato grader power operated	1	25000	25000
14. Corn sheller hand operated	1	800	800
15. Winower			
i. Hand operated	1	1000	1000
16. Juice Extractor			
i. Hand operated	2	500	1000
ii. Power operated	1	5000	5000
18. Gas Oven Complete	2 Set	2500	2500
19. Hammer Mill	1	50000	50000
20. Soya Bean Grinder (Net Type)	1	25000	25000
21. Misc. (Fruit preservation equipment and other minor tools etc.)		L.S.	20000

IRRIGATION LAB (IRRIGATION, DRAINAGE AND TUBEWELL ENGG.)

1. Open drain, close conduit, collecting tank and stop watch	1set	6000	6000
2. Infiltrimeter	2	3000	6000
3. Hook gauge and scale	2	2500	5000
4. Evaporation Tank	1	1000	1000
5. Lysimeter	2	5000	10000
6. Auger (Helical Type)	1	500	500
7. Balances	2	600	1200
8. Oven electrically operated	1	5000	5000
9. Sprinkler irrigation complete set with elect. pump, pipe, fittings etc.	1set	30000	30000
10. Model of surface drainage system	1	6000	6000
11. Model of subsurface drainage system	1	10000	10000
12. Turbine Pump	1	7000	7000
13. Lift pump single acting	1	2000	2000
14. Lift pump double acting	1	3000	3000
15. Infra red moisture meter	1	10000	10000
16. Pan Balance	2	1000	2000
17. Soil sampler and samle container	4 set	500	2000
18. Sinle pan electronic balance	1	10000	10000
Misc.		L.S.	5000

FARM AND LAND DEVELOPMENT MACHINERY LAB

1. Mould board plough			
Bullock driven	4	1500	6000
Power driven Two bottom	1	10000	10000
2. Disc Plough (2 disc)	1	10000	10000
3. Disc horrow i. power driven (12 disc)	1	12000	12000
ii. Animal drawn	1	2000	2000

4. Cultivator	animal drawn	1	1000	1000
	Power driven	1	5000	5000
5. Ridger(2 ferrow)		1	3000	3000
6. Rotavator		1	70000	70000
7. Puddlor	Animal drawn	1	1500	1500
	Power driven	1	7000	7000
8. Planter	Animal drawn	1	3000	3000
	Patoto Planter	1	20000	20000
9. Seed drill	Animal drawn	1	5000	5000
	(Complete)			
10. Automatic Rice Transplanter		1	300000	300000
11. Suger cane planter (Tractir Drawn)		1	550000	550000
12. Manure spreader		1	25000	25000
13. Fertilizer Bread Caster (Mannual)		1	3000	3000
14. Sprayer cum duster	Hand operated	1	2500	2500
15. L.P.G. Flame Weeder		1	8000	8000
15. Reaper	Power driven	1	30000	30000
17. Power thresher 10.0 HP		1	20000	20000
18. Paddy Thresher 5 HP Axil Flew Type		1	50000	50000
19. Paddy Thresher 10 HP (hand driven)		1	2500	2500
20. Ground Nut Digger Chourr		1	8000	8000
21. Potato digger (power driven)		1	20000	20000
22. Knap Sack Spryer Brass		1	1500	1500
	Plastic	1	1000	1000
23. Foot Sprayer		1	2000	2000
24. Leveller 2m (Power Driven)		1	5000	5000
25. Rotary Grass Cutter/Shrub masser		1	10000	10000
13. Automatic Multi Crop Harvester		1	1300000	1300000
Misc.			Lum Sum	50000

SOIL, WATER CONSERVATION AND LAND RECLAMATION ENGG. LAB

1. Rain Gauges				
i. Somens Rain Gauge		1	2500	2500
ii. Self recording rain gauges				
(a) Float Type		1	10000	10000
2. Working Model of:				
(a) Drop Spill Way		1	2000	2000
(b) Drop Inlet Spill Way		1	2500	2500
(c) Chute Spill way		1	3500	3500
3. Bund Farmer Disc Type		1	3500	3500
4. Pentagraph		1	2500	2500
5. Water Stage Recorder		1	5000	5000
Misc.			Lum Sum	30000

1. Zero Fill Ferts Seed Drill		1	15000	15000
2. Till Plant Machine		1	60000	60000
3. Raised bed Planter		1	30000	30000
4. Cage Wheel (1 Set)		1	3000	3000
5. Disc Type Band Former		1	3500	3500

GREEN HOUSE TECHNOLOGY, HYDROPONIC AND AQUAPONIC ENGG.

1. Small Size of Green House (12'X10')		1	200000	200000
with U.V. Stablized poly film				
2. Heating and cooling system assorted		1		
Type				
3. Hydroponic Tank and Trays, Pipe, etc.		1	100000	100000
assorted type				
4. Aquaponic tank and trays, pipe, etc.		1	100000	100000
assorted type				
5. Heating, Cooling & Aeration equip.		1		
assorted type				

INTRODUCTION TO COMPUTER (Common to all Trades)

COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST (in Rs.)
1.	Core-2 Quad Processor, 4GB RAM 1 GB SATA HDD, 19" TFT Monitor/ Server of Latest Specification OS-Windows 2007/2008/Latest Version	02 Server	1,20,000=00
2.	General Desktop Computer-Intel i5 60 node or Higher(with latest Specification Pre loaded latest Anti Virus with Life time Subscription, Licence Media and Manual with UPS 660 VA with latest window OS Including licence OR Computer of latest Specification With latest window os including licence		36,00,000=00
3.	Software :((Latest Version)		
	i. MS OFFICE 2010/Latest Version		LS LS
	ii. COMPILER 'C', C++, JAVA-7		LS LS
4.	Hardware		4,50,000.00 LS
	i. Switch-32 Port		02
	ii. Router		02
	iii. Hub		04(8 Port)
	iv. Ext. Modem		02
	v. Wireless N/W Adaptor		02
	vi. Series Access Point		02
	vii.LAN Cable Meter		05
	viii. LAN Cable Analyzer		05
	ix. Crimping Tool		15
	and all other accessories related to Networking		
5.	Scanner- Flat Bed A4/Auto Lighter (Bit depth 48)		02 20,000
6.	132 Column 600 CPS or faster 9 Pin dot matrix printer with 500 million character head life		02 50,000
7.	Laser Jet-A4 All In one 20 page per min (2 Each)		04 50,000
8.	Desk Jet-A4 Photo Smart (2 Each)		04 40,000
9.	5 KVA on line UPS with minimum 30 minute battery backup along with sealed maintenance free batteries. Provision for connecting external batteries with network		04 8,00000

	connectivity.(For 2 Labs)		
10.	Split Air Conditioner 1.5 tones capacity with ISI mark along with electronic voltage stabilizer with over voltage and time delay circuit	08	35,0000
11.	Room preparation and furniture	LS	
12.	19" rack, 24-port switch. connector RJ-45 Cat-6 cabling for network	LS	10,0000
13.	2 KVA Inverter Cum UPS	02	6,0000
14.	Fire Extinguisher (2 Kg.)	04	15000
15.	Fire Extinguisher (5 Kg.)	04	25000
16.	Vacuum Cleaner	02	25000
17.	LCD Projector 3000 Lumen with all Accessories	02	350000
18.	Pen Drive 16 GB	10	10000
19.	DVD Writer External	02	10000
20.	HDD External 500 GB	02	15000
21.	PAD (Latest Configuration)	02	15000
22.	Broadband For Internet(Speed Min. 8mbps)	04	LS
23.	USB Modem	02	8000
24.	Generator 15 KVA Water Coolant	01	450000

LIST OF LABORATORY EQUIPMENT(Energy Conservation)

Sr. No	Particulars	Qty	Estimated Cost (Rs)
1.	Multimeter	1	17,000
2.	Power Analyzer	1	20,000
3.	Luxmeter	1	5,000
4.	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25,000
5.	Centrifugal pump, 1 kW	1	15,000
6.	Variable Frequency drive	2	50,000
7.	Water Flow meter	1	10,000
8.	Pressure Gauge	1	2,000
9.	Experimental Set up for Valve Throttling vs VFD	1	50,000
10.	Compressor, 20 cfm, single-stage	1	50,000
11.	Air leakage meter	1	18,000
12.	Blower (2 HP)	1	8,000

7. LEARNING RESOURCE MATERIALS

1.	LCD Projector with Screen	1	--	20000
2.	Handicam	1	--	30000
3.	Cutting, Binding & Stitching equipment.	1	--	30000
4.	Desk Top Computer with Internet Core i5/i7- 760, Processor, Genuine Windiw 7, Professional 18 inch HD, Flat Panel Monitor Optical Mouse, Key Board & all related media or latest version	1	--	40000
5.	Home Theater Support Disc type CD. CDR/CDRW DVDR/DVDRW, VCD Supported with USB Port Support-DIVX/JPEG/MP3	1	--	25000
6.	Commerical P A System 16 W-220W output, AC & 24V DC Operated, 5 Mic. & 2 Auxilary input, Speaker output 4 Ohm, 8 Ohm, 17 V & 100 V	1	--	20000
7.	Interactive Board	1	--	50000

ote :

1. This center will be only one at the institute level irrespective of all branches.

STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

1. Presentations of Case Studies
2. Debate competitions
3. Poster competitions
4. Industrial visits
5. Visual Aids

COURSE OUTCOMES

After studying this course, a student will be able to co-relate and apply fundamental key concepts of energy conservation and energy management in industry, commercial and residential areas. A student will be able to:

- Define principles and objectives of energy management and energy audit.
- Understand Energy Conservation Act 2001 and its features.
- Understand various forms & elements of energy.
- Identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- Identify areas of energy conservation and adopt conservation methods in various systems.
- Evaluate the techno economic feasibility of the energy conservation technique adopted.

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

REFERENCE BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi&Shashank Jain published by TERI. Latest Edition
5. **Important Links:**
 - (i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
 - (ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
 - (iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
 - (iv) **Central Pollution Control Board (CPCB)**, Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.
 - (v) **Energy Efficiency Services Limited (EESL)**. www.eeslindia.org.
 - (vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

ANNEXURE-QUESTIONNAIRE

INSTITUTE OF RESEARCH, DEVELOPMENT AND TRAINING U.P. KANPUR -208024

SUBJECT: Questionnaire for ascertaining the job potential and activities of diploma holder in Agricultural Engineering.

PURPOSE: To design and develop diploma curriculum in Agricultural Engineering.

NOTE: 1. Please answer the questions to the points given in the questionnaire.
2. Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1. Name of the organisation: _____

2. Name & Designation of the officer _____
filling the questionnaire _____

3. Name of the department/section/
shop _____

4. Important functions of the _____
department/section/shop _____

5. Number of diploma holder employees
under your charge in the area of _____
Agricultural Engineering.

6. Please give names of modern equipments/machines handled by a
diploma holder in Agricultural Engineering.

1.	2.	3.
4.	5.	6.

7. What proficiencies are expected from a diploma holder in
Agricultural Engineering.

1.	2.	3.
4.	5.	6.

8. Mention the approximate percentage of the following desired in
Diploma teaching.

1. Theoretical knowledge	-----%
2. Practical knowledge	-----%
3. Skill Development	-----%

9. Do you think " on the job training" / Industrial training should form a part of curriculum. (Yes/ No)
if yes then
- (a) Duration of training -----
(b) Mode of training 1. Spread over different semesters
2. After completion of course
3. Any other mode
10. What mode of recruitment is followed by your organisation.
1. Academic merit
 2. Written test
 3. Group discussion
 4. Interview
 5. On the job test.
11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Agricultural Engineering.
- (a) Technical knowledge -----
(b) Practical skill -----
(c) Etiquettes and behaviour -----
(d) Aptitude -----
(e) Health habit and social background -----
(f) Institution where trained -----
12. Does your organisation have any system for the survey of Home articles of different countries/States. Yes/No
13. Does your organisation conduct field survey to know users views regarding. Yes/No
1. Home Articles for different age groups and sex.
 2. Effect of climatic conditions
 3. Any other
- If yes ; Please give brief account of each.
14. Which type of assignment do you suggest for an entrepreneur in Agricultural Engineering.
15. In which types of organisations can a diploma holder in Agricultural Engineering can work or serve.
- | | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
16. Job prospects for the diploma holder in Agricultural Engineering the next ten years in the state / country.
17. In your opinion what should be the subjects to be taught to a diploma student in Agricultural Engineering.
- | | |
|--------|-----------|
| Theory | Practical |
|--------|-----------|
18. Kindly mention particulars regarding topics/areas which should be given more emphasis in the curriculum .

- | Theory | Practical |
|--|-----------|
| 19. Kindly state whether your organisation can contribute towards improvement of curriculum in above field.
If yes : Please give names of experts in your organisation to whom contact. | Yes/ No |
| 20. Kindly give your valuable suggestions for being considered at the time of finilisation of curriculum. | |
| 21. What changes in technologies are to be incorporated in the development of curriculum in Agricultural Engineering. | |

(Signature)

Kindly mail the above questionnaire duly filled to:-

Ashish Gupta
Deputy Director
Institute of Research, Development & Training, U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential for the use of curriculum design only)

ANNEXURE - I

FIELD EXPOSURE - I

The second year students after their annual exam. will have undergo a four week Industrial Exposure in a medium/small scale unit (Agricultural Workshop, U.P. Agro Industrial corporation, Tractor Training and testing centre). It will be arranged and superwised by the institute staff. They will incorporate following points in their reports.

If inconvenient after annual exam, the industrial exposure can be arranged during second half of the session before the exam.

1. Name and Address of the unit
2. Date of
 - i. joining.
 - ii. Leaving
3. Nature of Industry
 - i. Product.
 - ii. Services
 - iii. Working Hrs.
4. Sections of the unit visited and activities there in.
5. Details of machines/Tools & instruments used in working in the section of the unit visited.
6. Work procedure in the section visited.
7. Specification of the product of the section and materials used.
8. Control of work & Quality.
9. Inspection procedures packing storing and dispacking of products.
10. Use of computer - if any
11. Visit of units store, Manner of keeping store items, Their reciving and distribution.
12. Safety measures on work place & working condition s in general comfortable, convenient and hygeinic.
13. Pollution, professional deseases and hazards if any. Precautionary measures.

ANNEXURE - II

FIELD EXPOSURE - II

The final year students will have a four week hands on Industrial Training engaged in units of soil and water conservation training center, minner irregation, Agro processing unit, construction units. It will be arranged and superwised the institute staff. The industrial exposure can be arranged during the second half of the session before the examination.

They will incorporate following points in their report.

1. Name and Address of the unit
2. Date of
 - i. joining.
 - ii. Leaving
3. Nature of Industry
 - i. Product.
 - ii. Services
 - iii. Working Hrs.
4. Sections of the unit visited and activities there in.
5. Details of machines/Tools & instruments used in working in the section of the unit visited.
6. Work procedure in the section visited.
7. Specification of the product of the section and materials used.
8. Control of work & Quality.
9. Inspection procedures packing storing and dispacking of products.
10. Use of computer - if any
11. Visit of units store, Manner of keeping store items, Their reciving and distribution.
12. Safety measures on work place & working condition s in general comfortable, convenient and hygeinic.
13. Pollution, professional deseases and hazards if any. Precautionary measures.

RECOMMENDED BOOKS

List of standard Text Books recommended for diploma level institutions of Uttar Pradesh

Sl.No.	TEXT BOOK	AUTHOR	MEDIUM	EDITION YR	COST	FULL ADDRESS OF PUBLICATION
1.	POST HARVEST TECHNOLOGY OF CEREALS PULSES AND OIL SEEDS	DR. A. CHAKRAVARTY		THIRD	120.00	OXFORD & IBH PUBLISHING CO. PVT. LTD., CALCUTTA
2.	UNIT OPERATIONS OF AGRICULTURAL ENGINEERING	K.M. SAHAI & K.K.SINGH		SECOND REVISED	210.00	VIKAS PUBLISHING HOUSE PVT. LTD., NEW DELHI
3.	PROCESSING AND CONVEYING EQUIPMENT DESIGN	P.S. PHIRKE		FIRST-2003	295.00	JAIN BROTHERS, NEW DELHI
4.	PRESERVATION OF FRUITS AND VEGETABLES	GIRDHARI LAL & G.S. SIDDAPPAA G.L. TANDON			125.00	I.C.A.R., NEW DELHI
5.	POST HARVEST TECHNOLOGY OF FRUIT AND VEGETABLES VOL1-GENERAL CONCEPT & PRINCIPLES VOL2- TECHNOLOGY	L. R. VERMA & V. K. JOSHI			SET OF TWO VOL. Rs. 2000	INDUS PUBLISHING COMPANY, NEW DELHI
6.	PRINCIPLES OF AGRICULTURAL PROCESSING A TEXT BOOK	P. H. PANDEY		1994	45.00	KALYANI PUBLISHER
7.	POST HARVEST TECHNOLOGY OF FRUITS & VEGETABLES (PRINCIPLES & PRACTICE	P. H. PANDEY		1997	75.00	SAROJ PRAKASHAN, ALLAHABAD
8.	DRYING AND STORAGE OF GRAINS AND OILSEEDS	D. B. BROOKER FRED W. BAKKER- ARKENA CARL W. HALL		1997	150.00	C.B.S. PUBLISHERS AND DISTRIBUTORS
9.	FRUITS & VEGETABLE PRESERVATION PRINCIPLES AND PRACTICE SECOND REVISED & ENLARGED EDITION	R.P. SRIVASTAVA SANJAY KUMAR		LATEST	190.00	INTERNATIONAL BOOK DISTRIBUTING COMPANY,LUCKNOW
10.	AGRICULTURAL ENGINEERING THROUGH WORK EXAMPLE	Dr. RADHEY LAL		LATEST	125.00	SAROJ PRAKASHAN, ALLAHABAD
11.	SEED PROCESSING	BILLY R. GREGG ALVIN G. LAW SHER S. VIVDI & JOHRI S. BALIS		1970		N. S. C., NEW DELHI
12.	SPEED STORAGE AND PACKAGING APPLICATIONS FOR INDIA	JAMES F. HARRINGTON AND JOHEMON E. DOU- ALAS		1970		N. S. C. & ROCKEFELLER FOUNDATION, NEW DELHI
13.	POST HARVEST TECHNOLOGY OF FRUITS AND VEGETABLES	A.K. THOMPSON				BLACK WELL SCIENCE LTD. OXFORD
14.	CIGR HANDBOOK ON AGRICULTURAL ENGINEERING VOL-IV AGRO PROCESSING	F.W.BAKKER - ARKEMA				AMERICAL SOCIETY OF AGRICULTURAL ENGINEERS
15.	PRINCIPLES OF AGRICULTURAL ENGG. VOL-I & II	MICHAEL & OJHA			250.00	M/S JAIN BROTHERS, NEW DELHI
16.	TRACTORS AND THEIR POWER UNITS	J.B LILIJEDHL, P.K. TRUNQUIST, DAVID W. SMITH, MAKOTA HOKE			210.00	C.B.S. PUBLISHER & DISTRIBUTORS, NEW DELHI
17.	FARM MACHINERY & EQUIPMENTS	C.P. NAKRA			60.00	DAMPAT RAI & SONS
18.	PRINCIPLES OF FARM MACHINERY	R.A. KEPNER, ROY BAINER & E.L. BERGER			150.00	C.B.S. PUB. & DISTRIBUTORS, NEW DELHI
19.	TECHNOLOGY AND APPLICATION OF BIO GAS	SRIVASTAVA & OJHA			100.00	JAIN BROTHERS, NEW DELHI
20.	AIR POLLUTION AND CONTROL	MURLI KRISHNA			160.00	JAIN BROTHERS, NEW DELHI
21.	FRAM POWER MACHINERY & SURVEYING	IRSHAD ALI			50.00	KITAB MAHAL
22.	NON CONVENTIONAL ENERGY	O.P. SINGHAL			75.00	SAROJ PRAKASHAN
23.	SOLAR ENERGY	O.P. SINGHAL			75.00	SAROJ PRAKASHAN
24.	SOIL & WATER CONSERVATION ENGG.	R. SURESH		2000	185.00	STANDARD PUBLISHER DISTRIBUTORS
25.	GROUND WATER AND TUBEWELL	S.P. GARG			129.00	OXFORD & IBH PUB. CO. PVT.
26.	GROUND WATER AND WELLS	JOHSON			170.00	JAIN BROTHERS, NEW DELHI
27.	GROUND WATER	H.M. RAGHUNATH		1983	40.00	WILEY EASTERN LTD.
28.	HYDROLOGY	H.M. RAGHUNATH		1988	55.00	WILEY EASTERN LTD.
29.	WATERSHED HYDROLOGY	R. SURESH		1997	100.00	STANDARD PUB. DISTRIBUTORS
30.	IRRIGATION PRACTICE & DESIGN	K.B. KHUSHLANI M. KHUSHLANI		1971	33.00	OXFORD & IBH PUB. CO. PVT.
