



DIPLOMA IN ENGINEERING AND TECHNOLOGY

BRANCH CODE: 1222/1023

**DEPARTMENT OF AGRICULTURAL TECHNOLOGY/
DEPARTMENT OF AGRICULTURAL ENGINEERING**

SEMESTER PATTERN

N – SCHEME

IMPLEMENTED FROM 2020 - 2021

CURRICULUM DEVELOPMENT CENTRE

**DIRECTORATE OF TECHNICAL EDUCATION
CHENNAI-600 025, TAMIL NADU**

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

**1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/
1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS**

N SCHEME

(Implemented from the Academic Year 2020 - 2021 onwards)

Chairperson

TMT. G.LAXMI PRIYA I.A.S.

Director, Directorate of Technical Education, Guindy, Chennai.

Coordinator

Thiru.R.KANAGARAJ

Principal, Government Polytechnic College,
Purasawalkam, Chennai.

Convener

Thiru. T.A.MOHAMED ISSAC M.E.,

Head of Department i/c/ Agricultural Technology
Sakthi Polytechnic College, Sakthi Nagar- 638315

MEMBERS

Thiru. P.Boopathi M.E., Lecturer(Sel. Grade)/ Agricultural Technology, Sakthi Polytechnic College Sakthi Nagar- 638315	Tmt. K.Sivagangai M.E.(Agri), Lecturer/ Agricultural Technology, Muthiah Polytechnic College, Annamalai Nagar, Chidambaram
Thiru. P.Gokulakrishnan M.E.(Agri), Head of Department Kongu Vellalar Polytechnic College, Seenapuram, Erode	Thiru. P.G.Dhamotharan Ph.D(Agri)., Head of Department (Social Science) Kumaraguru Institute of Agriculture, Sakthi Nagar- 638315
Thiru. P.Ashok Kumar M.Sc(Agri)., Deputy General Manager, Sakthi Sugars Ltd., Sakthi Nagar	Thiru.R.Manoharan B.E.Ag., Assistant Executive Engineer (AED), Erode.
Thiru.R.Parthiban M.E., Lecturer(Sel. Grade)/ Civil Engineering, Sakthi Polytechnic College Sakthi Nagar- 638315	

BLANK PAGE

DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY
(SEMESTER SYSTEM)
(Implemented from 2020 - 2021)
N – SCHEME
REGULATIONS*

**Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4th and/or during 7th semester the students undergo industrial training for six months / one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

- * ***Each Semester will have 16 weeks duration of study with 35 hrs. / Week for Regular Diploma Courses and 18 hrs. / Week for Part-Time Diploma Courses.***

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2020 – 2021 academic year onwards.

2. Condition for Admission:

Condition for admission to the Diploma courses shall be required to have passed in The S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for University Courses of study or equivalent examination & Should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational		Industrial Training Institutes Courses
		Subjects Studied	Subjects Studied		
			Related subjects	Vocational subjects	
1.	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational Subjects Theory & Practical	2 years course to be passed with appropriate Trade
2.	Diploma Course in Commercial Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship.	-

- For the Diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practicals may also be taken for arriving the eligibility.

- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.
- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Commercial Practice Diploma courses the candidates studied the related subjects will be given first preference.
- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N Scheme onwards i.e. from the academic year 2020-2021.

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects.

The curriculum outline is given in Annexure – I.

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Board Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are $75 + 25 = 100$ Marks.

9. Continuous Internal Assessment:

For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i) Subject Attendance

5 Marks

(Award of marks for subject attendance to each subject Theory/Practical will be as per the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

ii) Test #

10 Marks

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Average of the these two test marks will be taken and the marks to be reduced to: 05 Marks

The Test – III is to be the Model Examination covering all the five units and the marks obtained will be reduced to : 05 Marks

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6 th week	50	2 Hrs
Test II	Unit – III & IV	End of 12 th week	50	2 Hrs
Test III	Model Examination: Covering all the 5 Units. (Board examinations-question paper-pattern).	End of 16 th week	100	3 Hrs

From the Academic Year 2020 – 2021 onwards.

Question Paper Pattern for the Test - I and Test – II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions × 1 mark	06 marks
Part B Type questions:	7 Questions × 2 marks	14 marks
Part C Type questions:	2 Questions × 15 marks	30 marks
	Total	50 marks

iii) Assignment

5 Marks

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

iv) Seminar Presentation

5 Marks

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to

present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2 ½ marks for the material submitted in writing and 2 ½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

A. For Practical Subjects:

The Internal Assessment mark for a total of 25 marks which are to be distributed as follows:-

a) Attendance	: 5 Marks
	(Award of marks same as theory subjects)
b) Procedure/ observation and tabulation/ Other Practical related Work	: 10 Marks
c) Record writing	: 10 Marks
TOTAL	: 25 Marks

- *All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.*
- The observation note book / manual should be maintained for 10 marks. The observation note book / manual with sketches, circuits, programme, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.

- The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)
- Only regular students, appearing first time have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical subject.

10. Communication Skill Practical, Computer Application Practical and Physical

Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports.

11. Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to

do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work & Internship:

Project Review I	...	10 marks
Project Review II	...	10 marks
Attendance	...	05 marks (Award of marks same as theory subject pattern)
Total	...	25 marks

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Internship in Board Examinations:

Demonstration/Presentation	25 marks
Report	25 marks
Viva Voce	30 marks
Internship Report	20 marks
Total	100* marks

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year “Project Work & Internship” for 20 marks. The internship shall be undertaken in any industry / Government or

Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than *40% in theory subjects* and *50% in practical subjects* out of the total prescribed maximum marks including both the Internal Assessment and the Board Examinations marks put together, subject to the condition that he/she secures at least a minimum of *40 marks out of 100 marks in the Board Theory Examinations* and a minimum of *50 marks out of 100 marks in the Board Practical Examinations*.

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2023 onwards (Joined first year in 2020 -2021) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects

within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class**.

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

BLANK PAGE

ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/

1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS

(Implemented from the Academic year 2020-2021 onwards)

N – SCHEME

CURRICULUM OUTLINE

THIRD SEMESTER (FT)

Subject Code	Subjects	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical Hours	Total Hours
4020310	Strength of Materials*	5	-	-	5
4023320	Principles of Crop Production	5	-	-	5
4023330	Surveying and Levelling	5	-	-	5
4023340	Principles of Crop Production Practical	-	-	4	4
4020350	Machine Drawing and CAD Practical*	-	2	2	4
4023360	Surveying and Levelling Practical			5	5
4020370	Measurements and Metrology Practical*	-	-	4	4
		15	2	15	32
	Extra / Co-Curricular activities				
	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL				35

* Common to Mechanical Engineering Course

** Common to all Diploma Courses

BLANK PAGE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/
1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS
(Implemented from the Academic year 2020-2021 onwards)
N – SCHEME

FOURTH SEMESTER (FT)

Subject Code	Subjects	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical Hours	Total Hours
4023410	Fluid Mechanics & Hydraulics	6	-	-	6
4023420	Soil & Water Conservation Engineering	5	-	-	5
4020430	Electrical Drives & Control *	5	-	-	5
4020620	E Vehicle Technology & Policy *	4	-	-	4
4023450	Mechanical Testing & Fluid Power Practical	-	-	4	4
4023460	Machine shop-I Practical (Lathe and Welding)	-	-	4	4
4020470	Electrical Drives & Control Practical*	-	-	4	4
		20		12	32
	Extra / Co-Curricular activities				
	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL				35

* Common to Mechanical Engineering Course

** Common to all Diploma Courses

BLANK PAGE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/

1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS

(Implemented from the Academic year 2020-2021 onwards)

N – SCHEME

FIFTH SEMESTER (FT)

Subject Code	Subjects	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical Hours	Total Hours
4023510	Tractor and Its Power Units	5	-	-	5
4023520	Farm Machinery	5	-	-	5
	Elective Theory – I				
4023531	Post Harvest Technology	5	-	-	5
4020532	Green Energy and Energy Conservation*	5	-	-	
4023533	Sugarcane Crop Production	5	-	-	
4023540	Irrigation Engineering	5	-	-	5
4023550	Tractor and Its Power Units Practical	-		4	4
4023560	Machine shop-II Practical (Milling & Grinding)	-	-	4	4
4020570	Entrepreneurship & startup*	-	-	4	4
		20		12	32
	Extra / Co-Curricular activities				
	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL		-		35

BLANK PAGE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

**1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/
1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS**

(Implemented from the Academic year 2020-2021 onwards)

N – SCHEME

SIXTH SEMESTER (FT)

Subject Code	Subjects	HOURS PER WEEK			
		Theory Hours	Tutorial / Drawing	Practical Hours	Total Hours
4020610	Industrial Engineering & Management*	6	-	-	6
4020531	Computer Integrated Manufacturing*	5	-	-	5
	Elective Theory – II				
4023631	Food Process Engineering	5	-	-	5
4023632	Dairy Engineering	5	-	-	
4023633	Manufacturing Engineering	5	-	-	
4023640	Farm Machinery Practical	-	-	6	6
4020661	Computer Integrated Manufacturing Practical*	-	-	4	4
4023660	Project Work and Internship **	-	-	6	6
		16		16	32
	Extra / Co-Curricular activities				
	Physical Education	-	-	-	2
	Library	-			1
	TOTAL		-		35

* Common to Mechanical Engineering Course

** Common to all Diploma Courses

BLANK PAGE

ANNEXURE- II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/

1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS

(Implemented from the Academic year 2020-2021 onwards)

N – SCHEME

SCHEME OF EXAMINATION

THIRD SEMESTER (FT)

SUBJECT CODE.	SUBJECT	MARKS		TOTAL MARKS	MINIMUM FOR PASS	DURATION OF EXAM(HOURS)
		INTERNAL ASSESSMENT	BOARD EXAMINATION* (converted to 75)			
4020310	Strength of Materials**	25	100	100	40	3
4023320	Principles of Crop Production	25	100	100	40	3
4023330	Surveying and Levelling	25	100	100	40	3
4023340	Principles of Crop Production Practical	25	100	100	50	3
4020350	Machine Drawing and CAD Practical**	25	100	100	50	3
4023360	Surveying and Levelling Practical	25	100	100	50	3
4020370	Measurements and Metrology Practical**	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

** Common with Mechanical Engineering.

BLANK PAGE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/

1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS

(Implemented from the Academic year 2020-2021 onwards)

N – SCHEME

SCHEME OF EXAMINATION

FOURTH SEMESTER (FT)

SUBJECT CODE.	SUBJECT	MARKS		TOTAL MARKS	MINIMUM FOR PASS	DURATION OF EXAM(HOURS)
		INTERNAL ASSESSMENT	BOARD EXAMINATION* (converted to 75)			
4023410	Fluid Mechanics & Hydraulics	25	100	100	40	3
4023420	Soil & Water Conservation Engineering	25	100	100	40	3
4020430	Electrical Drives & Control **	25	100	100	40	3
4020620	E Vehicle Technology & Policy#	25	100	100	40	3
4023450	Mechanical Testing & Fluid Power Practical	25	100	100	50	3
4023460	Machine shop-I Practical (Lathe and Welding)	25	100	100	50	3
4020470	Electrical Drives & Control Practical**	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

** Common with Mechanical Engineering.

BLANK PAGE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/
1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS
(Implemented from the Academic year 2020-2021 onwards)
N- SCHEME
SCHEME OF EXAMINATION

FIFTH SEMESTER (FT)

SUBJECT CODE.	SUBJECT	MARKS		TOTAL MARKS	MINIMUM FOR PASS	DURATION OF EXAM(HOURS)
		INTERNAL ASSESSMENT	BOARD EXAMINATION* (converted to 75)			
4023510	Tractor and Its Power Units	25	100	100	40	3
4023520	Farm Machinery	25	100	100	40	3
ELECTIVE – I THEORY						
4023531	Post Harvest Technology	25	100	100	40	3
4020532	Green Energy and Energy Conservation**	25	100	100	40	3
4023532	Sugarcane Crop Production	25	100	100	40	3
4023540	Irrigation Engineering	25	100	100	40	3
4023550	Tractor and Its Power Units Practical	25	100	100	50	3
4023560	Machine shop-II Practical (Milling & Grinding)	25	100	100	50	3
4020570	Entrepreneurship development & startup#	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

** Common with Mechanical Engineering.

BLANK PAGE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
1222 DIPLOMA IN AGRICULTURAL TECHNOLOGY/
1023 DIPLOMA IN AGRICULTURAL ENGINEERING SYLLABUS
(Implemented from the Academic year 2020-2021 onwards)
N – SCHEME

SCHEME OF EXAMINATION

SIXTH SEMESTER (FT)

SUBJECT CODE.	SUBJECT	MARKS		TOTAL MARKS	MINIMUM FOR PASS	DURATION OF EXAM(HOURS)
		INTERNAL ASSESSMENT	BOARD EXAMINATION* (converted to 75)			
4020610	Industrial Engineering & Management**	25	100	100	40	3
4020531	Computer Integrated Manufacturing**	25	100	100	40	3
	ELECTIVE- II THEORY					
4023631	Food Process Engineering	25	100	100	40	3
4023632	Dairy Engineering	25	100	100	40	3
4023633	Manufacturing Engineering	25	100	100	40	3
4023640	Farm Machinery Practical	25	100	100	50	3
4020561	Computer Integrated Manufacturing Practical**	25	100	100	50	3
4023660	Project Work and Internship	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

** Common with Mechanical Engineering.

BLANK PAGE

List of Equivalent Subjects for M - Scheme to N – Scheme

M-Scheme		N-scheme	
Subject code	Subject name	Subject code	Subject name
III semester			
32031	Strength of Materials**	4020310	Strength of Materials**
32332	Principles of Crop Production	4023320	Principles of Crop Production
32033	Machine Drawing **	4020350	Machine Drawing and CAD Practical**
32334	Surveying and Levelling	4023330	Surveying and Levelling
32335	Principles of Crop Production Practical	4023340	Principles of Crop Production Practical
32336	Surveying and Levelling Practical	4023360	Surveying and Levelling Practical
30001	Computer Applications Practical **	40002^	Computer Application Practical ^
IV semester			
32341	Fluid mechanics	4023410	Fluid Mechanics & Hydraulics
32342	Soil & Water Conservation Engineering	4023420	Soil & Water Conservation Engineering
32343	Irrigation Engineering	4023540	Irrigation Engineering
32044	Electrical Drives & Control **	4020430	Electrical Drives & Control **
32345	Mechanical Testing & Fluid Power Practical	4023450	Mechanical Testing & Fluid Power Practical
32346	Computer Aided Drawing Practical	4020350*	Machine Drawing and CAD Practical**
32047	Electrical Drives & Control Practical**	4020470	Electrical Drives & Control Practical**

V semester			
32351	Tractor and Its Power Units	4023510	Tractor and Its Power Units
32352	Farm Machinery	4023520	Farm Machinery
32371	1. Post Harvest Technology	4023531	Post Harvest Technology
32372	2. Food Process Engineering	4023631	Food Process Engineering
32373	3. Renewable Energy Sources and Energy Conservation	4020532	Green Energy and Energy Conservation**
32354	Tractor and Its Power Units Practical	4023550	Tractor and Its Power Units Practical
32055	Process Automation Practical*	4020540*	Process Automation Practical*
32356	Machine shop-I Practical (Lathe & Welding)	4023460	Machine shop-I Practical (Lathe & Welding)
30002	Life and Employability Skill Practical #	40001*	Communication Skill Practical #
VI semester			
32061	Industrial Engineering & Management**	4020610	Industrial Engineering & Management*
32062	Computer Aided Design and Manufacturing **	4020531	Computer Integrated Manufacturing**
32381	Sugarcane Crop Production	4023532	Sugarcane Crop Production
32382	Dairy Engineering	4023632	Dairy Engineering
32383	Manufacturing Engineering	4023633	Manufacturing Engineering
32064	Farm Machinery Practical	4023640	Farm Machinery Practical
32365	Computer Aided Design and Manufacturing Practical**	4020561	Computer Integrated Manufacturing Practical**
32366	Machine shop-II Practical (Milling & Grinding)	4023560	Machine shop-II Practical (Milling & Grinding)
32367	Project Work		-

BLANK PAGE

ANNEXURE- I

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4020310
Semester : III
Subject Title : **STRENGTH OF MATERIALS****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instruction		Examination			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examinations	Total	
4020310 Strength of Materials**	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

** Common with Mechanical Engineering

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Engineering Materials	15
II	Deformation of Metals	15
III	Geometrical Properties of Sections and Thin Shells	15
IV	Theory of Torsion and Springs	14
V	SF and BM Diagrams of Beams and Theory of Bending	14
Test & Model Exam		7
Total		80

RATIONALE:

Day by day, engineering and technology experience tremendous growth. Design plays a major role in developing engineering and technology. Strength of material is backbone for design. The strength of material deals generally with the behaviour of objects, when they are subject to actions of forces. Evaluations derived from these basic fields provide the tools for investigation of mechanical structure.

OBJECTIVES

- Define various Support reaction and equilibrium.
- Calculate the deformation of materials, which are subjected to axial load and shear.
- Determine the moment of Inertia of various sections used in industries.
- Estimate the stresses induced in thin shells.
- Draw the shear force and bending moment diagram of the beam for different load.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	Engineering Materials 1.1: Engineering materials Classification - definition of Mechanical properties - definition of physical properties - ferrous metals - cast iron - uses - advantages - types of cast iron - properties and applications - effect of impurities on cast iron - Steel- classification - alloying elements - purpose of alloying - effect of alloying elements on steel - uses of steels - properties of mild steel - defects in steel - applications - properties of hard steel - market forms of steels - nonferrous metals - properties and uses.	7 Hrs
	1.2 Mechanical testing of materials Compression test - bend test - hardness test - Brinell	6 Hrs

	<p>hardness test, Vickers hardness test, Rockwell hardness test - impact test - fatigue test - creep test. Tensile test of mild steel in UTM - stress strain diagram - limit of proportionality - elastic limit - yield stress - breaking stress - ultimate stress – percentage of an elongation and percentage reduction in area - problems.</p> <p>1.3: Friction</p> <p>Introduction - definition - force of friction - limiting friction - static friction - dynamic friction - angle of friction - coefficient of friction - laws of static and dynamic friction.</p>	2 Hrs
II	<p>Deformation of Metals</p> <p>2.1 Simple stresses and strains</p> <p>Definition - load, stress and strain - classification of force systems - tensile, compressive and shear force systems - Hooke's law – definition Young's modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain – deformation due to tension and compressive force - simple problems in tension, compression and shear force.</p> <p>2.2 Elastic constants</p> <p>Definition - lateral strain - Poisson's ratio - volumetric strain - bulk modulus - volumetric strain of rectangular and circular bars - problems connecting linear, lateral and volumetric deformation - elastic constants and their relationship - problems on elastic constants. Composite bar - definition - problems in composite bars subjected to tension and compression. Temperature stresses and strains - simple problems.</p> <p>2.3 Strain Energy:</p> <p>Definition – proof resilience – modulus of resilience – the expression for strain energy stored in a bar due to axial load –</p>	4 Hrs 7 Hrs

	instantaneous stresses due to gradual, sudden, impact and shock loads – problems computing instantaneous stress and deformation in gradual, sudden, impact and shock loadings.	4 Hrs
III	<p>Geometrical Properties of Sections And Thin Shells</p> <p>3.1 Properties of sections</p> <p>Definition – center of gravity and centroid - position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium problems to determine the centroid of angle, channel, T and I sections only – Definition - centroidal axis - Axis of symmetry. Moment of Inertia – parallel axis theorem and perpendicular axis theorem (statement only)</p> <p>Moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections – Definition - Polar moment of Inertia - radius of gyration – Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections.</p> <p>3.2 Thin Shells</p> <p>Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.</p>	8 Hrs
IV	<p>Theory of Torsion And Springs</p> <p>4.1 Theory of Torsion</p> <p>Assumptions – torsion equation - Strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts –</p>	7 Hrs

	<p>comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems.</p> <p>4.2 Springs</p> <p>Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs.</p>	7 Hrs
V	<p>SF and BM Diagrams of Beams And Theory Of Bending</p> <p>5.1 SF and BM diagrams</p> <p>Classification of beams – Definition – shear force and Bending moment –sign conventions for shear force and bending moment – types of loadings – Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simply supported beam subjected to point load and uniformly distributed load (udl) – Determination of Maximum bending moment in cantilever beam and simply supported beam when they are subjected to point load and uniformly distributed load.</p> <p>5.2Theory of bending</p> <p>Theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – $M/I=f/y=E/R$ – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simple supported beam.</p>	<p>7 Hrs</p> <p>7 Hrs</p>

Reference Books:

1. Strength of Materials, R. S. Khurmi, S.Chand & Co., Ram Nagar, New Delhi.
2. Strength of Materials, S. Ramamrutham, 15th Edition 2004, DhanpatRai Pub. Co., New Delhi.
3. Strength of Materials, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 3rd Edition, 2010.
4. Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
5. Strength of Materials, B K Sarkar, I Edition, 2003 Tata Mcgraw hill, New Delhi.
6. Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2nd Edition, 2007.

Board Examination- Question Paper Pattern

Time: 3 Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023320

Semester : III

Subject Title : **PRINCIPLES OF CROP PRODUCTION**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4023320 Principles of Crop Production	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Introduction	15
II	Rice , sugarcane and cotton	15
III	Pulses and oil seeds	15
IV	Horticultural crops – vegetables and fruit crops	14
V	Horticultural crops – spices and flower crops	14
Test & Model Exam		7
Total		80

RATIONALE:

The course is so designed to learn more about the recent advances made in crop production techniques for the crops prescribed viz., rice, sugarcane, cotton, groundnut, coconut, pulses, fruits and vegetables.

OBJECTIVES:

- To understand about the climatic conditions and soil conditions of Tamilnadu.
- To impart knowledge on main crops like of rice, sugarcane and cotton and their cultivation techniques.
- To impart knowledge on the main pulses and oil seed crops of Tamilnadu.
- To impart knowledge on the important vegetable and fruit crops of Tamilnadu.
- To impart knowledge on the important spices and flower crops of Tamilnadu.

**4023320 PRINCIPLES OF CROP PRODUCTION
DETAILED SYLLABUS**

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>Introduction</p> <p>Climate of Tamil Nadu-Weather-Climate-Microclimate-Importance of climate and its forecasting. Seasons of Tamil Nadu-Important seasons and crops of Tamil Nadu- Agro climatic zones-Factors affecting crop production-Climate-Soil factors-Biological factors. Soil fertility of Tamil Nadu-Functions of Soil-soil types of Tamil Nadu and its distribution. Characteristic of soil-Physical properties-Chemical properties-Biological Properties. Soil fertility and soil productivity-Methods of improving soil productivity-List of crops suitable for different soil types.</p>	15 Hrs
II	<p>2.1 Rice</p> <p>Biological Name – season & variety –field preparation – seed rate - seed treatment – sowing of seedling – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p> <p>2.2 Sugarcane</p> <p>Biological Name – season & variety –field preparation – sett rate - sett treatment – sowing of seedling – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p> <p>2.3 Cotton</p> <p>Biological Name – season & variety –field preparation – seed rate- seed treatment – sowing of seed – fertilizer application –</p>	15 Hrs

	spacing – water management - weed management – disease management – pest management – harvesting –post harvest technology..	
III	<p>3.1 PULSES</p> <p>Red gram, Green gram, Black gram, Cowpea, Bengal gram – Biological Name – season & variety –field preparation – seed rate- seed treatment – sowing of seed – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p> <p>3.2 OIL SEEDS</p> <p>Groundnut, Coconut, Gingelly - Biological Name – season & variety –field preparation – seed rate- seed treatment – sowing of seed – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p>	15 Hrs
IV	<p>Horticulture Crops</p> <p>4.1 Vegetable Crops</p> <p>Tomato , Bhendi, Bringal, chilly, Bitter Guard, Cluster beans - Biological Name – season & variety –field preparation – seed rate- seed treatment – sowing of seed – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p> <p>4.2 Fruit Crops</p> <p>Mango, Banana, Grapes, Lemon, Papaya - Biological Name – season & variety –field preparation – seed rate- seed treatment – sowing of seed – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p>	14 Hrs

V	<p>5.1 Spices Turmeric, Pepper, Ginger, Mustard, Coriander - Biological Name – season & variety –field preparation – seed rate- seed treatment – sowing of seed – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p> <p>5.2 Flower Crops Rose, Malligai, Mullai, Chrysanthemum, Marigold - Biological Name – season & variety –field preparation – seed rate- seed treatment – sowing of seed – fertilizer application – spacing – water management - weed management – disease management – pest management – harvesting – crop production.</p>	14 Hrs
---	--	---------------

Reference Books:

1. TNAU website on crops.
2. Handbook of agriculture – ICAR, Publication – New Delhi.
3. Handbook of Horticulture – ICAR. Publication – New Delhi.
4. Crop Production Techniques for Horticultural crops – TNAU, Coimbatore.
5. Crop Production guide – Directorate of Agriculture – Chepauk, Chennai.
- Ahlawat, I.P.S., Prakash O.M. and Saini. G.S. 1999.
6. Scientific crop production India. Aman publishing house

Board Examination- Question Paper Pattern

Time: 3 Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023330

Semester : III

Subject Title : **SURVEYING AND LEVELLING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4023330 Surveying And Levelling	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours:

UNIT	Topic	Hrs.
I	Introduction and linear measurements	15
II	Levelling	14
III	Contouring and computation of areas and volumes.	15
IV	Angular measurements and total station.	15
V	Modern surveying- Global positioning system, Geographical information system and Remote Sensing	14
Test & Model Exam		7
Total		80

RATIONALE:

The advancement of survey in the field of Agriculture in global positioning system, mapping in geographical information system and remote sensing techniques have grown to several folds. The incorporation of latest technology provides a basic foundation for the prosperity of Agricultural Technology students to become a land surveyor, proficient in handling advanced surveying instruments.

OBJECTIVES:

- On completion of this module, the student should be able to:
- Understand the basic principles and scope of surveying
- Know how to use chains and tapes in taking linear measurements.
- Know the basics of leveling using dumpy level to deduce levels of points.
- Know the principal of measurement of angles using prismatic compass.
- Know the principles of measurement of angles and bearings using vernier theodolite, and optical theodolite by trigonometrical leveling.
- Know the basics of Tacheometry and contouring.
- Know the basics of Total Station to measure angles, distances and altitudes.
- Know the basics of Global positioning system and how to locate the station with latitude and longitude observations.
- Know the basics of the Geographical information sys system and how to plot the map using the primary principles of mapping software.

**4023330 SURVEYING AND LEVELLING
DETAILED SYLLABUS**

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>INTRODUCTION AND LINEAR MEASUREMENTS:</p> <p>1.1 Introduction: Definition, Objectives, Divisions of surveying (plane and geodetic) – Principles of surveying: Location of a point and work from whole to the part – Classification of surveying- Uses.</p> <p>1.2 Linear Measurements: Introduction- Chain Surveying- Types of chains-Types of tapes– Survey stations and survey lines- Types of offsets- Ranging- Direct and reciprocal ranging- chaining along a flat and slopping ground.</p>	15 Hrs
II	<p>Levelling</p> <p>2.1 Introduction: Definitions- Levelling instruments, Different types of levels and staves; Datum level - bench marks, types-Temporary adjustments. Line of collimation, Axis of telescope, Foresight, Back sight, Intermediate sight, Height of collimation, Change point.</p> <p>2.2 Methods of Reduction of levels: Methods of Reduction of levels- problems in reduction of levels by Height of collimation and rise and fall method with a minimum of two or three change points– Arithmetical check – Methods of levelling.</p>	14 Hrs
III	<p>Contouring and Computation of Areas And Volumes:</p> <p>3.1 Contouring: Definitions, Contour interval and horizontal equivalent;</p>	15 Hrs

	<p>Characteristics of contour lines- Direct and indirect methods of contouring- interpolation of contours- Use of contour maps.</p> <p>3.2 Computation of areas and volumes:</p> <p>Computation of an area of a ground with squares and triangles- computation of areas and volumes using average ordinate rule, end ordinate rule, trapezoidal rule and Simpson's rule- problems.</p>	
IV	<p>Angular Measurements And Total Station:</p> <p>4.1 Compass surveying:</p> <p>The prismatic Compass: Component and their parts and their use- Reference meridians- magnetic and true meridian; Dip and declination; Whole circle and quadrantal bearing- Fore and back bearing</p> <p>4.2 Theodolite surveying :</p> <p>Theodolite, Types- transit and non-transit - Component and their parts of a vernier theodolite - Fundamental lines- Temporary adjustments- Measurement of horizontal and vertical angles. (Theory only)</p> <p>4.3 Total station:</p> <p>Features- advantages- field procedure to measure horizontal distances and altitudes- to measure horizontal angle and vertical angle- to fix co-ordinates.</p>	15 Hrs
V	<p>Modern Surveying:</p> <p>5.1 Global positioning system (GPS)- Components of GPS receivers- applications/ uses- procedure for the Location of a point with its latitude and longitude – tracking a point- routing.</p> <p>5.2 Geographical information system(GIS):</p> <p>Components of GIS- Comparison of Ordinary mapping with GIS software- fields of applications – Land</p>	14 Hrs

	Information System (LIS) 5.3 Remote Sensing: Methods of remote sensing- Remote sensing techniques for Agriculture survey.	
--	--	--

Text books:

1. Agor R -A Text Book of Surveying And Levelling 2009, Khanna Publishers. New Delhi.
2. Hussain. S.K. and Nagaraj. M.S. 1992, Text Book of Surveying. S. Chand & Co. Ltd. New Delhi.
3. Kanetkar. R.P. and Kulkarni. S.V. 1993, Surveying and Levelling, Part-I and part-II 23rd Edition,Pune, Vaidyartha Griha Prakashani.
4. 4Basak N N 2004,Surveying and Levelling, Tata Mcgraw -Hill Publishing co Ltd. New Delhi

Reference books:

1. Kochher, C.I. 1993, A Text Book of Surveying. S.K. Katariya & Son

Board Examination- Question Paper Pattern

Time: 3 Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implements from the academic year 2021-2022 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023340

Semester : III

Subject Title : **PRINCIPLES OF CROP PRODUCTION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4023340 Principles of Crop Production Practical	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

The topics for practical are so designed to impart technical skills not only on the cultivation techniques but also the processing and post – harvest practices for the prescribed crops, which will provide confidence in the minds of young agricultural technologists to become job providers rather than job seekers.

OBJECTIVES:

1. To have a knowledge about plants and seeds.
2. To have a work on hand practice on rice and sugarcane cultivation.
3. To learn about seed processing of plants.
4. To have work on hand practice on coconut and mango planting.

4023340 PRINCIPLES OF CROP PRODUCTION PRACTICAL
DETAILED SYLLABUS

Contents: Practical

LIST OF EXPERIMENTS AND ALLOCATION OF HOURS		
Exercises	Topic	(Hours)
	PART – A	
1	Identification of plants and seeds.	30 Hrs
2	Nursery techniques for rice.	
3	Seed treatment techniques for rice .	
4	After cultivation practices for sugarcane.	
5	Methods of Fertilizer application to sugarcane.	
6	Assessment of cane maturity (Brix meter)	
7	Acid delinting in cotton.	
8	Gypsum application and peg formation in groundnut.	
	PART –B	
9	Nursery management for coconut.	30 Hrs
10	Planting techniques in coconut.	
11	Fertilizer management for coconut.	
12	Propagation techniques of mango.	
13	Banana sucker treatment and intercultural operations.	
14	Training and pruning in grapes.	
15	Nursery management for Chillies, tomato and bhendi.	
16	Seed extraction of chillies, tomato and bendi.	

BOARD EXAMINATION

Note:

All the fifteen experiments given in the list of experiments should be completed and given for the end semester practical examination.

In order to develop best skills in handling Instruments/Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.

The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

DETAILED ALLOCATION OF MARKS

Examination Duration : 3 Hrs	Max. Marks 100	
	Part A	Part B
Aim, Procedure	10	10
Observation / field work	15	15
Result	15	15
Total	40	40
Identification	15	
Viva Voce	5	
Total	100	

Board Examination-Question Paper Pattern

Give one question from part-A and one from part-B.

Part -C identification of plants and seeds.

LIST OF EQUIPMENTS (For a batch of 30 students)

1. Axe
2. Chisel
3. Cutter (aruval)
4. Budding knife, pruning knife, grafting knife, chopping knife.
5. Pruning secateurs
6. Hedge shear, lopping shear, forester shear
7. Flower scissors
8. Crow bar
9. Manvetti
10. Hatchets, Scythes
11. Brix meter.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4020350
Semester : III
Subject Title : **MACHINE DRAWING AND CAD PRACTICAL****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4020350 Machine Drawing And Cad Practical	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

**Common with Mechanical Engineering

RATIONALE:

Mechanical Engineering Diploma Engineer is expected to possess a thorough understanding of drawing, which includes clear visualization and proficiency in reading and interpreting a wide variety of production drawing. Manufacturing of various parts start from the basic drawing of components. The assembly of components is also carried out from the drawing. So drawing is an important subject to be studied by the students to carry and complete the production and assembly process successfully.

OBJECTIVES:

- To learn the parts and assembly of the machine components.

- To appreciate the need for sectional view and types of sections.
- To draw sectional views.
- To practice manual drawing
- To use Computer Aided Drafting.
- To prepare geometrical model of various machine elements.
- To draw the different views of machine elements.
- To interpret the drawing in engineering field and illustrate three dimensional objects.

4020350 Machine Drawing and CAD Practical DETAILED SYLLABUS

Contents: Practical

PART–A: MANUAL DRAWING PRACTICE

Sectioning - sectional views – representation of sectional plane – hatching – inclination – spacing – hatching large areas – hatching adjacent parts - full section – half section – types of half sections – conventional representation of materials in section – Dimensioning - Detailed drawings of the machine parts are given to students to assemble and draw any two views of the machine elements in the Drawing Sheet. Front View /Full Section / Half Section Front View and Top View / Left Side View / Right Side View with dimensions.

PART–B: COMPUTER AIDED DRAFTING (CAD)

CAD applications – Hardware requirement – Software requirement – CAD screen interface – menus – Toolbars – types of co-ordinate system – Creating 2D objects – Using draw commands – Creating text – Drawing with precision – Osnap options – drafting settings – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys – Editing and modify commands – Object selection methods – Erasing object – Oops – Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing properties – Color – line types – LTscale – Matching properties – Editing with grips – Pedit – Ddedit – Mledit - Basic dimensioning – Editing dimensions –

Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – Wblock – inserting a block – Block attributes – Hatching – Pattern types – Boundary hatch – working with layers – Controlling the drawing display – Blipmode – View group commands – Zoom, redraw, regen, regenauto, pan, viewers –Realtime zoom. Inquiry groups– calculating area – Distance – Time– Status of drawing– Using calculator. Plot

Detailed drawings of the machine parts are given to students to assemble and draw any two views of the machine elements in the Drawing Sheet. Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View with dimensions in the CAD software.

EXERCISE:

Draw the Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View in the given drawing sheet and create the same in the CAD package.

1. Sleeve & Cotter joint
2. Screw jack
3. Plummer Block
4. Simple Eccentric
5. Machine Vice
6. Protected type flanged coupling

PART A: Manual Drawing in the Drawing sheet

Draw the Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View in the given part drawing of the components in the drawing sheet.

Note: For Board Examination only Front view should be given for manual drawing part.

PART B: Computer Aided Drafting in the CAD package

Create the Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View in the given part drawing of the components in any one of the CAD package.

Note: For Board Examination TWO views should be created.

Reference Books:

1. A Textbook of Machine Drawing, Pritam Singh Gill, S.K.Kataria & Sons.
2. Machine Drawing, N.D.Bhatt, V.M.Panchal, Charoter Publishing House.
3. Introducing Autocad 2010 and Autocad LT 2010, George Omura, Wiley India Pvt. Ltd.
4. A Text book of Engineering Drawing, R.B.Gupta, Satya Prakasan, Technical India Publications.
5. Engineering Drawing, D.N. Ghose, Dhanpat Rai & Sons, Delhi

Internal Mark

Note: All the students should maintain the observation note book / manual as per the regulation. Every student should submit the manual drawing sheet and printout of the CAD output of his work for the record work.

All the exercises manual drawing sheet should be submitted and evaluated for 40 Marks each. The average marks should be converted to 10 Marks.

Drawing Sheet (Six Exercise Average)	- 10 Mark
Observation and Record work	- 10 Mark
Attendance	- 05 Marks
Total	- 25 Marks

BOARD EXAMINATION**DETAILED ALLOCATION OF MARKS**

Note: All the exercises should be completed by both Manual and CAD. All the exercise should be given for examination, the students are permitted to select by lot or the question paper from DOTE should be followed. Record note book should be submitted during examination. The manual drawing and printout of cad of his work should be submitted and the same have to be evaluated as per the allocation.

	Allocation of Marks	Examination Duration : 3 Hrs
	PART-A Manual Drawing	30 MARKS
	Assemble Front view	30
	PART-B CAD	60 MARKS
	Drafting	20
	Assembly	20
	Dimensioning	20
	Viva-voce	10
	TOTAL	100

MODEL QUESTION PAPER

EXERCISE:

Draw the Front View / Full Section / Half Section Front View and Top View / Left Side View / Right Side View in the given drawing sheet and create the same in the CAD package.

Submit the Manual drawing sheet and printout of the CAD output.

Sleeve & Cotter joint / Screw jack / Plummer Block / Simple Eccentric / Machine Vice / Protected type flanged coupling

LISTOF EQUIPMENT (For a batch of 30 students)

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Software's: Office Package, CAD Package – Sufficient to the strength.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023360

Semester : III

Subject Title : **SURVEYING AND LEVELLING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours /Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4023360 Surveying And Levelling Practical	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

The advancement of survey in the field of Agriculture in global positioning system, mapping in geographical information system and remote sensing techniques have grown to several folds. The incorporation of latest technology provides a basic foundation for the prosperity of Agricultural Technology students to become a land surveyor, proficient in handling advanced surveying instruments.

OBJECTIVES:

- To understand types of surveying works required.
- To know the different method and equipments to be used for different surveys.
- To understand the use and operational details of various surveying equipments.
- To know the methods of chain surveying and Theodolite surveying and their uses.

- To understand the principles of Electronic Distance Measurement equipment and Total station and their use.
- To know the concept of remote sensing, GPS and GIS.

4023360 SURVEYING AND LEVELLING PRACTICAL
DETAILED SYLLABUS

Contents: Practical

LIST OF EXPERIMENTS AND ALLOCATION OF HOURS		
Exercises	Topic	(Hours)
	PART – A	
1	Chain survey Determination of area of a plot by taking perpendicular and oblique offsets.	8 Hrs
2	Determination of area of narrow strip of land.	
3	Global positioning system-GPS Determination of location of a point with latitude and longitude observations using a handheld GPS receiver.	8Hrs
4	Routing and fixing way stations using a handheld GPS receiver.	
5	Total Station Determination of horizontal distance between two points and reduced level of those points.	8 Hrs
6	Determination of horizontal angle between two points.	
	PART –B	
7	Levelling Fly levelling– Reduction of levels by Height of collimation method-minimum six points (inclusive of two change points)	20 Hrs
8	Fly levelling– Inclusive of an inverted level reading-	

	Reduction of levels by Height of collimation method- minimum six points (inclusive of two change points)	
9	Fly levelling –Reduction of levels by Rise and fall method-minimum six points (inclusive of two change points).	
10	Fly levelling– Inclusive of an inverted level reading- Reduction of levels by Rise and fall method-minimum six points (inclusive of two change points).	
11	Check levelling and reduction of levels.	
12	Theodolite survey Measurement of horizontal angle by repetition method.	12 Hrs
13	Measurement of horizontal angle by reiteration method.	
14	Measurement of vertical angle.	

BOARD EXAMINATION

Note:

All the 14 experiments given in the list of experiments should be completed and given for the end semester practical examination.

In order to develop best skills in handling Instruments/Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.

The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

DETAILED ALLOCATION OF MARKS

Sl. No	Examination Duration : 3 Hrs Item	Max Marks 100	
		Part A	Part B
1	Aim, Procedure, and Formula	10	10
2	Tabulation & Observation	15	15
3	Calculation	15	15

4	Result	5	5
	Total	45	45
5	Viva Voce	10	
	Total	100	

Board Examination- Question Paper Pattern

Give one question from part-A and one from part-B.

List of equipments (for a batch of 30 students)

1.	Metric chain (30m)	-5Nos
2.	Metric chain (20m)	-5Nos
3.	Metallic tape (30m)	-5Nos
4.	Metallic Tape (15m)	-5Nos
5.	Cross staff (wooden)	-10Nos
6.	Ranging rod	-50Nos
7.	Arrow	-100Nos
8.	Wooden peg	-50Nos
9.	Levelling instrument (Dumpy level)	-15Nos
10.	Levelling staff (aluminium body 4m long-Telescopic)	-10Nos
11.	Levelling staff wooden(4m-Telescopic)	-5Nos
12.	Vernier theodolite/ Micrometer theodolite	-10Nos
13.	Total station	1No(Min)
14.	GPS receiver	-2Nos

SAFETY PRECAUTIONS TO BE FOLLOWED

1. Handle the ranging rod with care while moving among the public as the sharp end may harm.
2. Handle all the electronic equipments with extra care.
3. Batteries after use should be removed from the equipment to prevent leakage.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4020370
Semester : III
Subject Title : **MEASUREMENTS AND METROLOGY PRACTICAL****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	4020370 Measurements And Metrology Practical**	Hours / week	Hours /Semester	Marks		
			Internal Assessment	Board Examinations	Total	
4 Hrs		64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

** Common with Mechanical Engineering.

OBJECTIVES:

- Familiarize about measuring techniques of Metrology instruments.
- Select the range of measuring tools. Study of accuracy of instruments and calibration of instruments.
- Obtain accurate measurements.
- Determine the least count of measuring instruments.
- Acquire knowledge about linear measurement.
- Acquire knowledge about angular measurement.
- Acquire knowledge about geometric measurements.

- Study of Linear Measuring Instruments: Vernier Caliper, Micrometer, Inside Micrometer, Vernier Height gauge and Slip Gauge.
- Study of Angular Measuring Instruments–Universal Bevel Protractor, Sine Bar.
- Study of Geometric measurement - Gear tooth Vernier, Thread Vernier.

4020370 MEASUREMENTS AND METROLOGY PRACTICAL

DETAILED SYLLABUS

Exercises

PART A: Linear Measurements:

1. Measure the dimensions of ground MS flat / cylindrical bush using Vernier Caliper compare with Digital / Dial Vernier Caliper.
2. Measure the diameter of a wire using micrometer and compare the result with digital micrometer.
3. Measure the thickness of ground MS plates using slip gauges
4. Measure the inside diameter of the bore of a bush cylindrical component using inside micrometer compare the result with digital micro meter.
5. Measure the height of gauge blocks or parallel bars using vernier height gauge.
6. Measure the speed lathe spindle using stroboscope.

PART B: Angular measurements / Comparators:

1. Measure the angle of a V-block / Taper Shank of Drill / Dovetail using universal bevel protractor.
2. Measure the angle of the machined surface using sine bar with slip gauges.
3. Measure the geometrical dimensions of V-Thread using thread Vernier gauge.
4. Measure the geometrical dimensions of spur gear.
5. Find out the measurement of given component and Compare with a standard component using mechanical comparator and slip gauge.
6. Prepare a specimen to examine and find the grain structure using the Metallurgical Microscope.

BOARD EXAMINATION

Note:

- All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailed allocation of Marks

	Part-A 45 marks	Part-B 45 marks
Procedure / Preparation	10	10
Observation / Dimensions	25	25
Finishing	10	10
Viva-voce	10	
Total	100	

LIST OF EQUIPMENTS (For a batch of 30 students)

1. Vernier Caliper - 2 Nos.
2. Digital /dial Vernier Caliper. - 2 Nos.
3. outside micrometer - 2 Nos.
4. inside Micrometer - 2 Nos
5. Digital Micrometer - 2 Nos.
6. Slip gauges - 2 Nos.
7. Universal bevel protractor. - 2 Nos.

8. Sine bar - 2 Nos.
9. Digital inside micrometer - 2 Nos.
10. Surface plate - 2 Nos.
11. Vernier height gauge - 1No.
12. Thread Vernier - 1 No.
13. Stroboscope. - 2 Nos.
14. Gear tooth Vernier - 2 Nos.
15. Mechanical comparator - 2 Nos.
16. Dial indicator (0-10) - 2 Nos.
17. Pneumatic comparator - 1 No.
18. Consumable - Sufficient quantity

Blank page

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023410
Semester : IV
Subject Title : **FLUID MECHANICS & HYDRAULICS**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours /Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4023410 Fluid Mechanics & Hydraulics	6 Hrs	96 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Properties of Fluids, Pressure And Its Measurement	18
II	Flow of Fluids, Orifices and Mouth Pieces	18
III	Flow Through Pipes, Notches & Weirs and Open Channels	18
IV	Centrifugal Pumps, Reciprocating Pumps and other pumps.	17
V	Pneumatic system and Hydraulic system	18
Test & Model Exam		7
Total		96

RATIONALE:

Now a days the fluid mechanics find wide applications in many situations directly or indirectly. Agricultural engineers are expected to have the knowledge and the understanding of the basic principles and concepts of fluid mechanics both in static and dynamic conditions. This is to enable them to analyze and design systems in which fluid is the working medium.

OBJECTIVES:

- To understand the various properties of fluids, pressure and pressure measurements.
- To understand fluid flow, Bernoulli's theorem and its application.
- To know head loss and water hammer in fluid flowing through pipes and open channels, and power generation.
- To learn different types of pumps and their uses.
- To understand about pneumatics and hydraulics and the machineries.

4023410 FLUID MECHANICS & HYDRAULICS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topic	Hours
I	1.1 Properties Of Fluids: Definition-fluid mechanics, fluids- types-Properties of fluids – mass, weight, mass density, weight density, specific volume, specific gravity, compressibility, vapour pressure, cohesion and adhesion, surface tension, capillarity, viscosity, kinematic viscosity – classification of fluids –simple problems on density and specific gravity. 1.2 Pressure And Its Measurement: Pressure units – atmospheric pressure – gauge pressure – vacuum pressure –absolute pressure – simple problems- pressure vary with depth and pressure head – pressure head in terms of equivalent liquid column – Pascal's law of transmissibility (only definition) –applications – Pressure device –Piezometer tubes – U-tube manometers (simple and	18 Hrs

	<p>differential only)- simple problems.</p> <p>Mechanical pressure gauges: Bourdon's tube, diaphragm and dead weight pressure gauges.</p> <p>Pressure on plane surfaces – Total pressure – centre of pressure – depth of centre of pressure – simple problems on fluid pressure on plane surfaces immerse in liquid vertically and inclined.</p>	
II	<p>2.1 Flow Of Fluids:</p> <p>Types of fluid flow – steady and unsteady – uniform and non-uniform – laminar and turbulent, definitions only – mean velocity of flow- principles of fluid flow- discharge of a flowing fluid, units – Law of conservation of mass- Equation of continuity of flow (one dimensional) – Energies of fluid- Hydraulic energy and total head – Bernoulli's theorem (statement only, no proof) – Bernoulli's assumptions- limitations – practical applications – problems –Venturimeter- construction- derivation for discharge through Venturimeter – simple problems – Orifice meter – comparison with Venturimeter – Pitot tubes.</p> <p>2.2 Orifices And Mouth Pieces:</p> <p>Orifice – definition – classification of orifices – Flow through small orifice – head causing flow –definitions of Jet and Vena-contracta – velocity and discharge through an orifice – hydraulic coefficients and its relationship – Experimental determination of co-efficient of velocity-Jet distance measurement method- velocity measurement method- simple problems – Large rectangular orifice- Discharge through large rectangular orifice- derivation- simple problems- Mouth piece - definition – types(only).</p>	18Hrs
III	<p>3.1 Flow Through Pipes:</p> <p>Definition of pipe – Critical velocity – Reynold's number – hydraulic gradient line and total energy line – definitions – wetted perimeter – hydraulic radius – losses in pipes – Major</p>	18 Hrs

	<p>losses – minor losses- loss of head due to friction in pipe line – Darcy-Weisbach equation derivation– Chezy’s equation derivation – loss of head due to sudden enlargement – sudden contraction – entry in to a pipe – exit from a pipe – an obstruction – change in direction (only formulae for minor loses)- water hammer– power transmission through pipes – maximum power – efficiency of transmission – simple problems.</p> <p>3.2 Flow Through Notches & Weirs:</p> <p>Notches – definitions- crest or sill- nappe or vein – types – discharge through rectangular & triangular notches – derivations- Advantages of V-notch over rectangular notch – simple problems– Cippoletti notch- Weirs – difference between notch and weirs- discharge through rectangular weir (only formula)- Classification of weirs- Cippoletti weir. (no derivations or problems)</p> <p>3.3 Flow Through Open Channels:</p> <p>Flow through open channels: Open channel – definition & types – Bed slope, wetted perimeter, hydraulic mean depth and hydraulic slope – Chezy’s formula for velocity of flow in open channel –derivation- value of Chezy’s constant– Basin’s formula, Kutter’s formula and Manning’s formula (only formulae- no derivations) – simple problems using Chezy’s constant and Basin’s formula, Kutter’s formula and Manning’s formula. Economical sections of open channel- derivation for conditions for an Economical rectangular section - problems – Venturiflume.</p>	
IV	<p>4.1 Centrifugal Pumps</p> <p>Centrifugal pumps –classifications- components- construction and working – Types of casings and impellers – priming – use of foot valve and strainers – Multistage pumps – pumps in parallel- pumps in series- Advantages of multi-stage pumps- Maximum height of suction– Cavitation- Heads of centrifugal</p>	17 Hrs

	<p>pump- Simple Problems on discharge, power and efficiency- Maintenance and repair of centrifugal pumps — Criteria for selection of pump.</p> <p>4.2 Reciprocating Pumps</p> <p>Reciprocating pumps – classifications – working of single acting and double acting reciprocating pump – plunger and piston pumps – discharge of a reciprocating pump – theoretical power required – coefficient of discharge – slip – negative slip – separation or cavitations – air vessel –simple problems.</p> <p>4.3 Special pumps – jet pumps – Turbine pumps – Submersible pumps – Working principles – no problems. Hydraulic power plant – turbines-definition - classification of turbines.</p>	
<p>V</p>	<p>5.1 Pneumatic system:</p> <p>Introduction – elements of pneumatic system- air filters- pressure regulator- lubricator- air service unit (FRL package)- pneumatic valves- pressure control valves- pressure relief (limiting)- direction control valves- classifications- check valves- 2/2DCV- 3/2DCV- 4/2DCV- 4/3DCV- pneumatic circuits- single acting cylinder- double acting cylinder- metering-in control and metering-out control.</p> <p>5.2 Hydraulic system:</p> <p>Introduction – elements of hydraulic system- Advantages and disadvantages of hydraulic system- Hydraulic accumulators- types- weighted – spring loaded- gas operated- bladder – fluid power pumps- types-gear pump- vane pump- hydraulic actuators- single acting cylinder- double acting cylinder- gear type and vane type- hydraulic valves- pressure control valves- pressure relief valves- pressure reducing valves- flow control valve- globe valve- needle valve- gate valve- direction control valve- types. Meter-in and meter-out circuits- pneumatic system vs hydraulic system.</p>	<p>18 Hrs</p>

Reference books:

1. Hydraulics and fluid Mechanics – Dr.P.N.Modi and Dr.S.N.Seth
2. Hydraulics, Fluid Mechanics and Hydraulic Machines – R.S. Khurmi
3. Fluid mechanics – Bansal.

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023420
Semester : IV
Subject Title : **SOIL & WATER CONSERVATION ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
4023420 Soil & Water Conservation Engineering	Hour/ week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Introduction & Mechanism of Erosion	15
II	Wind Erosion	15
III	Methods to Control Soil Erosion	15
IV	Gully Erosion and Gully Control measures	14
V	Permanent Gully control Structures	14
Test & Model Exam		7
Total		80

RATIONALE:

Soil and Water Conservation engineering is one of the basic subject in the field of Agricultural engineering. Since the main focus of agricultural engineering is production maximization, Soil and water conservation is the major area where these resources are basic and important for Crop Production.

Evil effects of soil erosion should be understood clearly then only the suitable conservation measures may be found out.

OBJECTIVES:

- To study problems of soil erosion and Hydrology of small water sheds.
- To study on Wind Erosion and factors influencing soil erosion by wind and its control.
- To study Land use Capability, agronomical and engineering measures to control erosion.
- To study about gully formation and its control methods and structures.

4023420 SOIL & WATER CONSERVATION ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	<p>Introduction & Mechanism of Erosion</p> <p>1.1 Soil erosion : Introduction – Definition of Soil erosion – Types of soil erosion – Water erosion – definition factors affecting water erosion- Types of water erosion and their effects- rain drop erosion, sheer erosion, rill erosion, gully erosion– Principles of gully erosion- waterfall erosion, channel erosion – Four stages of Gully development – classification of Gullies.</p> <p>1.2 Hydrology of small water sheds: Hydrology of small water sheds – rainfall- Gauging of Rainfall - Runoff- Types of runoff - factors affecting Runoff - Rational</p>	15 Hrs

	Method of prediction of Runoff Rate - Runoff Hydrograph – Unit Hydrograph – its components- Measurement of Runoff.	
II	<p>Wind Erosion</p> <p>2.1 Mechanics of Wind erosion:</p> <p>Wind Erosion definition – Factors affecting Wind erosion - Mechanics of Wind erosion – initiation of soil movement-suspension, saltation and surface creep- transportation of soil particles- deposition of soil particles- Adverse effects of Wind erosion – Sand dunes – Types – Threshold velocity.</p> <p>2.2 Control Soil Erosion by Wind:</p> <p>Factors influencing Soil Erodibility by wind – Estimating Soil erosion by wind – Measures to Control Soil Erosion by Wind – Vegetation and Vegetative Management – Tillage Practices and Machinery to Control Soil Blowing – Surface Roughness – Wind Breaks and shelter belts.</p>	15 Hrs
III	<p>Field Structures to Control Erosion :</p> <p>3.1 Land use Capability and measures to control erosion:</p> <p>Field structures and Practices to Control erosion by water – Land use Capability Classification and Land use planning – Soil conservation measures- Agronomical and engineering- contour farming, strip cropping- types of strip cropping, tillage practices- conservation tillage, mulch tillage, minimum tillage, conventional tillage.</p> <p>3.2 Engineering measures to control erosion:</p> <p>Contour Trenching- types- advantages. Terracing- classification of terraces- Types of Terraces – construction of terraces and maintenance- Bench Terraces- Types-Level, inward sloping and outward sloping– Bunds-types of bunds- classification of bunding system- Contour Bunding- function of contour bunding - Construction of contour Bunds- limitations of contour bunds – Graded Bunds- functions of graded bunds- limitations- types of graded bunds-design specification of bunds- Vegetated Water ways – Forestry in soil conservation.</p>	15 Hrs

<p>IV</p>	<p>Gully Erosion</p> <p>4.1 Gully Control and Ravine Reclamation:</p> <p>Definitions – Gully – Gully Erosion- classification of gullies- Gully Control planning – Topographic survey and mapping of gully areas- closure to grazing and other biotic interference. Controlling Runoff – retention, diversion and conveyance of runoff- Vegetation in Gully Control – Changing Gullies into Grassed Water ways and Establishment of sod Flumes – Sod Checks and shrub Checks – Checking the Growth of Gullies – Gully Control Procedure.</p> <p>4.2 Gully control structures:</p> <p>Gully Control Structures – Temporary Check Dams – types- Woven Wire Dams, Brush dams, loose rock dams, plank or slab dams, log and pole dams.</p>	<p>14 Hrs</p>
<p>V</p>	<p>Permanent Gully control structure:</p> <p>5.1 Permanent Structures for Gully control:</p> <p>Permanent Structures for soil conservation and Gully control – purpose- Causes of Failures- Types of Structures- Planning for Gully Control- Definitions of spill ways, main spillway, auxiliary spillway, emergency spillway, stepped spillway, overflow spillway, side channel spillway, crests, free board, critical depth, critical flow- hydraulic jump- types.</p> <p>5.2 Basic components of soil conservation Structures:</p> <p>Basic components of soil conservation and Gully Control Structures- components of spillways- inlet, outlet and conduit- Check dams- earth dams- advantages and limitations- maintenance- Drop Spill Ways – components of drop spillways- Inlet – Outlet – advantages and disadvantages- Chute Spill ways- components of chute spillway- Inlet, Channel section – Outlet – advantages and limitations- Drop inlet Spillway- advantages and limitations.</p>	<p>14 Hrs</p>

Reference Books:

1. Principles of Agricultural Engineering Vol II A.M. Michael, T.P. Ojah.
2. Soil and water conservation Engineering R. Suresh

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4020430
Semester : IV
Subject Title : **ELECTRICAL DRIVES & CONTROL****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours /Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4020430 Electrical Drives & Control	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

** Common with Mechanical Engineering.

Topics and Allocation of Hours:

UNIT	Topic	Hrs.
I	Dc Circuits and Dc Machines	15
II	Ac Circuits and Ac Machines	15
III	Special Machines & Drives	15
IV	Power Supplies, Control Elements and Electrical Safety	14
V	Display Devices, Logic Gates and PLC	14
Test & Model Exam		7
Total		80

RATIONALE:

The automation is being the order of the day to improve the production with high quality consciousness. Such automation involves electrically operated switches, sensors controlled through electrically driven motors and actuators. The subject aims in introducing the basic electrical DC and AC circuits and motors and also focuses on the various special control devices like stepper, servo drives and its controlling elements

OBJECTIVES:

- Explore fundamental electric circuit laws.
- Explain the working principle of DC and AC Electrical machines.
- Identify the effective uses of drives of Electrical machines.
- Analyze the various power supply circuits.
- Select the field controlled elements.
- Explain the construction and working of Transformer.
- Compare the different types of Logic gates.
- Appreciate the safety practices followed in Electrical system.
- Compare the use of servo motors and stepper motors in electrical driving system
- Identify PLC Input outputs.
- Identify the use of Control elements.

4020430 ELECTRICAL DRIVES & CONTROL
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	DC Circuits And Dc Machines 1.1 DC Circuits Definition- Electric Current, Voltage and Resistance -Ohm's law and Kirchoff's law. Resistance in series, parallel and series parallel – simple problems - Electromagnetism (definitions only) – Magnetic flux, Flux density, Magnetic field intensity, MMF, Permeability, Reluctance, Faraday's law of Electromagnetic induction, Electrical and Mechanical	15 Hrs

	<p>units.</p> <p>1.2 DC Machines</p> <p>DC Generators – Construction, Principle of operation and Applications. DC Motors: - Construction, Principle of operation and Applications. Necessity of starters: Three point, four point starters.</p>	
II	<p>AC Circuits And Ac Machines</p> <p>2.1 AC Circuits</p> <p>Fundamentals of AC voltage, and current – Peak, Average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only).</p> <p>Transformer: Principle of operation and construction – EMF equation - Losses in Transformer – Efficiency – Applications. Alternator construction – Principle of operation and Applications.</p> <p>2.2 AC Machines</p> <p>AC Motors- Principle of operation of Single Phase, Capacitor Start induction motor - universal motor - Applications- Three Phase Induction Motors – Squirrel Cage and Slip ring Induction motors (Construction and Working Principle only) - Applications – Speed control of 3Φ Induction Motor - DOL and star/delta starter.</p>	15 Hrs
III	<p>Special Machines & Drives</p> <p>3.1 Special Machines:</p> <p>PMDC Motor, Stepper motor- Construction and Working Principle and Applications - Servo motor – types. Permanent Magnet Servo motor Construction and Applications. Brushless Servo motor - Construction and Applications.</p> <p>3.2 Drives:</p> <p>Industrial drives- types, Group drive, Individual drive, Multi motor drive. Block diagram of Variable Frequency Drive (VFD). Stepper motor Drive: Single stepping and Half stepping Servo drives. DC Servo drive, AC Servo drive and</p>	14 Hrs

	BLDC Servo drive.	
IV	<p>Power Supplies, Control Elements And Electrical Safety</p> <p>1.1 Power Supplies: Rectifiers – Half wave, Full wave and Bridge rectifiers – Necessity of Filters- Regulated Power Supplies: IC Voltage Regulators. Batteries - Working, Constructions, Maintenances and Trouble shooting.</p> <p>4.2 Control Elements: Fuses – Selection of Fuse – Necessity of Fuse- Fuse switch units. Sensors: Photo electric sensor, Inductive Proximity sensors, Temperature sensors. Contactors - usage – Necessity of Contactor- Solenoid type Contactor.</p> <p>4.3 Safety Elements: Circuit breakers – Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB). Electrical Safety: - Importance of Earthing - Electric shock: First aid, Precautions - Causes of Accident and their Preventive measures.</p>	15 Hrs
V	<p>Display Devices, Logic Gates And PLC</p> <p>5.1 Display Devices: Display devices – LED, 7 segments LED, LCD. Logic gates: Positive and Negative Logic, Definition, Symbol and truth table.</p> <p>5.2 Logistic Gates: Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND EXNOR gates. Universal Logic Gates: NAND, and NOR.</p> <p>5.3 PLC: Features of PLC-PLC Block diagram- PLC scan. Fixed and Modular PLC. Ladder logic - NO, NC contacts-Coils - AND logic, OR logic.</p>	14 Hrs

Reference Books:

1. Fundamentals of physics –Brijlal and Subramaniam.
2. Fundamentals of Electricity –D.N. Vasudeva –S. Chand & co
3. Electric motors and drives, Austin Hughes
4. A text book of Electrical Technology, Volume II, B.L.Theraja, S. Chand & co.
5. Programmable Logic Controllers – John R Hackworth Frederick D.Hackworth Jr., Pearson Education.

Board Examination- Question Paper Pattern

Time: 3 Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4020620
Semester : IV
Subject Title : **E VEHICLE TECHNOLOGY & POLICY****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4020620 E Vehicle Technology & Policy**	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

** Common with Mechanical Engineering.

Topics and Allocation of Hours:

UNIT	Topic	Hrs.
I	Environmental impact and history& Electric vehicle Types	12
II	Electric vehicle, Electric Propulsion System	12
III	Energy Storages, Charging, Effects and Impacts	11
IV	Electric Mobility Policy Frame work India	11
V	Tamilnadu E-Vehicle Policy 2019	11
Test & Model Exam		7
Total		64

RATIONALE:

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducing dependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries. They can help to reduce dependence on fossil fuels also air quality. Tamil Nadu is one of the most advanced states in India. Tamil Nadu has a highly developed industrial eco-system and is very strong in sectors like automobiles and auto-components. Many globally renowned companies have setup their manufacturing facilities in Tamil Nadu. Due the rapid depletion of fossil fuel and increase in fuel cost, environmental pollution, the shift to clean transport is necessary. This subject introduced by keeping all the above factors.

OBJECTIVES:

- To learn the environmental impact and history of Electric Vehicles.
- To understand the concept of Electric Vehicle and its types.
- To study the configurations of Electric Vehicles
- To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
- To appreciate the Electric Mobility Policy Frame work India and EV Policy Tamil Nadu 2019.

4020440 E Vehicle Technology & Policy

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	<p>Environmental impact and history: Environmental impact of conventional vehicle - Air pollution – Petroleum resources – History of Electric vehicles & Hybrid Electric Vehicles - Conventional drive train system – Rear Wheel, Front Wheel and All wheel - Parts of Drive train system.</p> <p>Electric vehicle Types: Introduction to Battery Electric Vehicle (BEV) – Definition BEV – Necessity BEV – Different between BEV and Conventional Vehicle - Advantages of BEV - Block diagram of BEV – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) – Fuel Cell Electric Vehicle (FCEV) – Description.</p>	12 Hrs
II	<p>Electric Vehicles: Configurations of Electric Vehicle – Performance of Electric Vehicles Tractive Effort in Normal Driving – energy consumption. Hybrid Electric Vehicles: Concept of Hybrid electric drive trains – Architecture of Hybrid Electric Drive trains – Series, Parallel and Series & Parallel.</p> <p>Electric Propulsion Systems: Types of EV motors - DC motor drives– Permanent Magnetic Brush Less DC Motor Drives (BLDC) – Principles, Construction and Working – Hub motor Drive system – Merits and Demerits of DC motor drive, BLDC motor drive.</p>	12 Hrs
III	<p>Energy Storages: Electrochemical Batteries – Battery Technologies – Construction and working of Lead Acid Batteries, Nickel Based Batteries and Lithium Based Batteries Role of</p>	11 Hrs

	<p>Battery Management System (BMS)– Battery pack development Technology– Cell Series and Parallel connection to develop battery pack.</p> <p>Charging: Battery Charging techniques - Constant current and Constant voltage, Trickle charging – Battery Swapping Techniques – DC charging – Wireless charging – Maintenance of Battery pack – Latest development in battery chemistry.</p> <p>Effects and Impacts: Effects of EV – Impacts on Power grid – Impacts on Environment – Impacts on Economy.</p>	
IV	<p>Electric Mobility Policy Frame work India</p> <p>Government of India Electric Mobility Policy Frame work – Global Scenario of EV adoption – Electric mobility in India – National Electric Mobility Mission Plan 2020 – Action led by Original Equipment Manufacturers – Need of EV Policy – Advantage of EV Eco system – Scope and Applicability of EV Policy – ARAI Standards for Electric Vehicle – AIS038, AIS039 & AIS123 - Key Performance Indicator - Global impact – Trends and Future Developments</p>	11 Hrs
V	<p>Tamil Nadu E-Vehicle Policy 2019</p> <p>Tamil Nadu E-vehicle Policy 2019: Vehicle Population in Tamil Nadu – Objectives of EV Policy – Policy Measures – Demand side incentives – Supply side incentives to promote EV manufacturing – Revision of Transport Regulation of EV – City building codes – Capacity Building and Skilling – Charging structure – implementing agencies – Research & Development and Business Incubation – Recycling Ecosystem – Battery and EVs.</p>	11 Hrs

Reference Books

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
2. Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR), Akshat Bansal, Akriti Agarwal
3. A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, Sanjeevikumar Padmanaban, Lucian Mihet-Popa, Mohammad Nurunnabi Mollah and Eklas Hossain.
4. Electric Vehicles: A future Projection CII October 2020 report.
5. Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang, Harold Knickle, Elsevier.
6. Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
7. ZERO EMISSION VEHICLES (ZEVs): TOWARDS A POLICY FRAMEWORK – NTI Aayog.
8. FASTER ADOPTION OF ELECTRIC VEHICLES IN INDIA: PERSPECTIVE OF CONSUMERS AND INDUSTRY, The Energy and Resources Institute, New Delhi.
9. India EV Story: Emerging Opportunities by Innovation Norway.
10. Automotive Industry Standards – AIS 038, AIS 039 & AIS 123 – Manual

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023450
Semester : IV
Subject Title : **MECHANICAL TESTING & FLUID POWER**
PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4023450 Mechanical Testing & Fluid Power Practical	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

The modern advancement in the field of Mechanical testing of materials and fluid power can be well effected only when on hand experience is imparted to the students. The quality of materials used and the advantages of hydraulic power, fluid power and pneumatic power can be well understood by the students only in the practical classes.

OBJECTIVES:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss in fluid flowing through pipes.
- To learn how to measure the discharge using various devices.
- To learn different types of pumps and their uses.

4023450 MECHANICAL TESTING & FLUID POWER PRACTICAL

DETAILED SYLLABUS

Contents: Practical

LIST OF EXPERIMENTS AND ALLOCATION OF HOURS		
Exercise	Topics	Hours
	Mechanical Testing:	
1	Determine the yield stress, ultimate stress, breaking stress, working stress, percentage of elongation and percentage of reduction for materials like mild steel/TMT bars by conducting tension test using universal testing machine.	20
2	Determine the deflection and young's modulus of mild steel/hollow circular simply supported section by applying a point load at the center.	
3	Determine the shear strength of various materials like steel/mild steel/ TMT bars by conducting shear test using universal testing machine.	
4	Determine the modulus of rigidity by performing torsion test on mild steel specimen.	
5	Determine the specific impact energy by conducting Izod impact test on materials like mild steel, cast iron, copper etc.,	
6	Determine the Brinell/Rockwell hardness number by conducting hardness test on materials like mild steel, cast iron, copper etc.,	
7	Determine the modulus of rigidity on the closed coil spring of mild steel specimen.	
	Fluid Power	
8	Verification of Bernoulli's Theorem.	24
9	Determine the coefficient of discharge of a venture-meter.	
10	Determine the coefficient of discharge of an orifice meter.	
11	Determine the coefficient of discharge through flow measuring devices like orifice by constant head/ variable head method.	

12	Determine the coefficient of discharge through a mouth piece by constant head/ variable head method.	
13	Determine the friction factor of the given pipe.	
	Pumps and Pneumatics:	
14	Conduct performance test on Centrifugal pump.	12
15	Conduct performance test on Reciprocating pump.	
16	Make suitable pneumatic circuit of metering in or metering out connection using the double acting reciprocating cylinder with flow regulator, control valve and check valve.	
	Test and Revision	4
	Total	60

BOARD EXAMINATION

Note:

All the sixteen experiments given in the list of experiments should be completed and given for the end semester practical examination.

In order to develop best skills in handling Instruments/Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.

The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

DETAILED ALLOCATION OF MARKS

Duration of Examination: 3 Hours

Max Marks 100

Sl.No.	Item	Mechanical Testing Practical	Fluid Power Practical
1	Aim, Procedure, and Formula	10	10
2	Tabulation	10	10
3	Observation	10	10
4	Calculation	10	10
5	Result	5	5
	Total	45	45
6	Viva Voce	10	
	Total	100	

Board Examination-Question Paper Pattern

One question from material testing and one question from fluid mechanics.

LIST OF EQUIPMENTS (for a batch of 30 students)

Mechanical testing lab:

1. UTM machine
2. Simple bending apparatus
3. Torsion testing machine
4. Charpy's/ Izod testing machine
5. Spring testing machine.
6. Brinell/ Rockwell hardness testing machine.

Hydraulic lab:

1. Orifice tank
2. Mouthpiece tank
3. Venture meter
4. Orifice meter
5. Bernoulli's apparatus
6. Pipe friction apparatus
7. Centrifugal pump
8. Reciprocating pump
9. Pneumatic circuit kit.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023460
Semester : IV
Subject Title : **MACHINE SHOP- I PRACTICAL (LATHE & WELDING)**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours /Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4023460 Machine Shop- I Practical (Lathe & Welding)	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

It is very much important to impart basic welding skills to the Diploma Engineer as it is one of the most important manufacturing and salvaging technique.

They should be given training to use both arc welding equipment and Gas welding equipments. The safety precautions should be taught to them. Practice should be given to maintain the welding equipments. Students should know how to strike the arc, maintaining the arc, current selection for particular thickness and how to obtain various types of flames. They should be trained to do welding of different configurations.

Basic skills in lathe should be given to Diploma Engineers. Exposure to the working principles and various kinds of tools and methods of Turning, Drilling operations should be given.

OBJECTIVES:

- Identify the parts of a center lathe
- Identify the work holding devices
- Set the tools for various operations
- Operate the lathe and Machine a component using lathe
- Identify the tools and equipments used in welding
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appreciate the safety practices used in welding.

4023460 MACHINE SHOP- I PRACTICAL (LATHE & WELDING)**DETAILED SYLLABUS**

Contents: Practical

Name of the Topics:**Lathe**

1. Introduction of safety in operating machines.
2. Introduction to lathe and its parts.
3. Introduction to work holding devices and tool holding devices.
4. Types of tools used in lathe work.
5. Types of measuring instruments and their uses.
6. Setting of work and tools.
7. Operation of lathe.
8. Practice on a lathe.

Exercises:

1. Plain turning
2. Step turning
3. Taper turning
4. Knurling
5. Thread cutting
6. Bushing.

Welding

- a. Introduction of Safety in welding shop.
- b. Introduction to hand tools and equipments.

c. Arc and gas welding equipments.

d. Types of joints

Exercises:

a. Arc welding

1. Lap joint (Material : 25 mm x 6mm MS flat)
2. Butt joint (Material : 25mm x 6mm MS flat)
3. T- joint (Material: 25mm x 6mm MS flat)
4. Corner joint (Material: 25mm x 6mm MS flat)

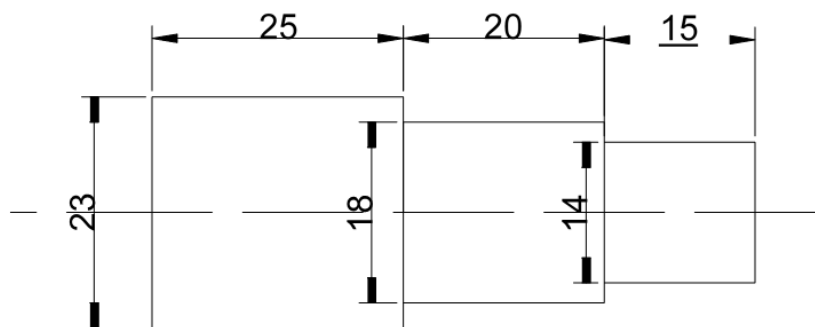
Gas welding

1. Butt joint (Material : 25mm x 6mm MS flat)

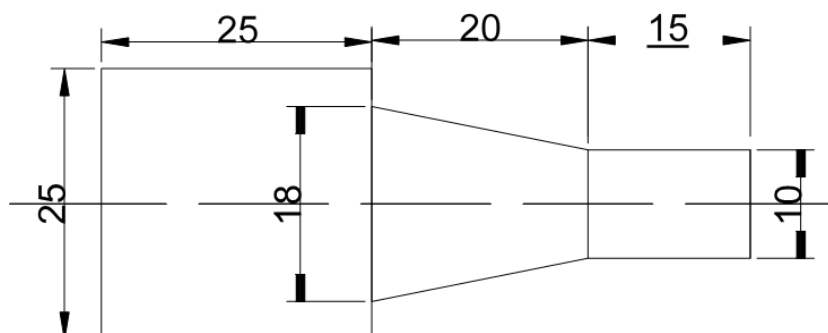
Spot welding:

1. Lap joint

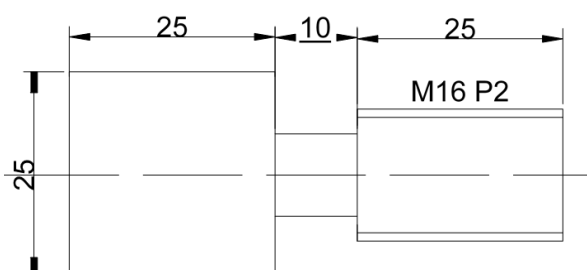
1. Step turning



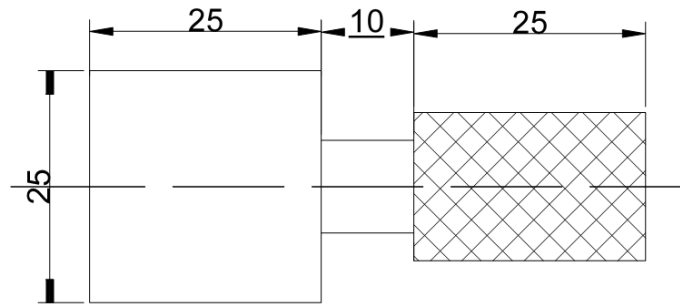
2. Taper turning



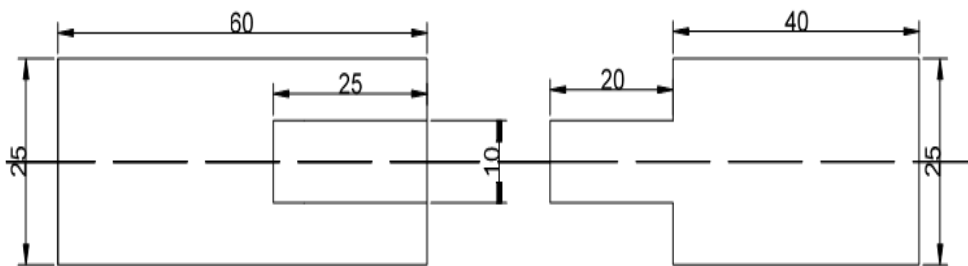
3. Thread cutting



4. Knurling:



5. Bushing:



BOARD EXAMINATION

Note:

All the experiments given in the list of experiments should be completed and given for the end semester practical examination.

- In order to develop best skills in handling Instruments/Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

All dimensions in mm

Note to the faculty: Last job of the raw material (MS Rod $\text{Ø}32 \times 77\text{mm}$ and MS Rod $\text{Ø}25 \times 77\text{mm}$) to be retain in student wise or batch wise .This may be verifiable at the time of Board Practical Examination by the external examiner.

All linear dimensions in $\pm 0.5\text{mm}$ and All cylindrical dimensions in $\pm 0.2\text{mm}$ tolerance.

DETAILED ALLOCATION OF MARKS

Sl.No.	Description	Max. Marks 100
Part – A		Lathe [60 Marks]
1.	Procedure/Preparation	15
	Machining/Dimensions	30
	Surface Finishing	15
Part – B		Welding [35 Marks]
2.	Procedure /Edge preparation	10
	Welding / Cutting	20
	Joint strength / Finish	05
3.	Viva-Voce	05
Total		100

(Questions By lot Equal distribution in a session)

Board Examination-Question Paper Pattern

Have to do one exercise in lathe and one in welding.

LIST OF EQUIPMENTS (for a batch of 30 students):

1. A.C / D.C welding machine	-	1+1set
2. Electrodes with cables	-	1set
3. Earth Clamp with cables	-	1set
4. Leather / Asbestos Apron	-	15
5. Leather / Asbestos hand gloves	-	15
6. Hand Shield	-	15
7. Helmet	-	15
8. Safety goggles	-	15
9. Chipping Hammer	-	5
10. Wire Brush	-	5

11. Tong	-	15
12. Gas welding torch	-	2
13. Gas welding Nozzle set	-	1set
14. Nozzle cleaner set	-	1
15. Oxygen regulator	-	1
16. Acetylene regulator	-	1
17. Oxygen & Acetylene Hose in required length	-	1+1
18. Hose clips	-	4
19. Hose connector	-	4
20. Spark lighter	-	4
21. Water Bucket	-	2
22. Oxygen Cylinder	-	2
23. Acetylene Cylinder	-	2
24. Trolley	-	1

Machines and Instruments:

1. Center Lathe 4 ½ ' Bed length	–	15 No's
2. 4 Jaw / 3 Jaw Chucks	–	required Numbers
3. Chuck key (10 mm x 10 mm size)	–	15 No's
4. Box spanner	–	15 No's
5. Cutting Tool H.S.S ¼ " X ¼ " X 4 " long	–	15 No's
6. Pitch gauge	–	5 Nos
7. Vernier Caliper (0-25 and 25-50)	–	5 nos each
8. Micrometer, Inside and Outside(0-25 and 25-50) -		5 each
9. Vernier Height Gauge(300mm)	-	1 no
10. Snap gauge	–	1 set
11. Gear tooth Vernier	-	1 No
12. Steel Rule (0-150)	-	15 Nos.
13. Outside and Inside Calipers	-	15 Nos. each
14. Thread gauge	-	5 Nos.
15. Bevel Protractor	-	1 No
16. Jenny Caliper	-	5 Nos.
17. Dial Gauge with Magnetic Stand	-	5 Nos.
18. Marking Gauge	-	10 Nos.
19. Safety Glass	-	15 Nos.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4020470

Semester : IV

Subject Title : **ELECTRIC DRIVES & CONTROL PRACTICAL****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4020470 Electrical Drives & Control Practical	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

** Common with Mechanical Engineering.

OBJECTIVES:

- Identify starters for different motors.
- Study and prepare earthing.
- Test the characteristics of DC and AC machines.
- Identify and select controlling elements.
- Explore the performance of ELCB, MCB.
- Design regulated power supplies.
- Identify display devices - LED, 7 segment LED, LCD.
- Identify the drive circuit for special motors. Test the speed control circuit of the special motors.

**4020470 ELECTRIC DRIVES & CONTROL PRACTICAL
DETAILED SYLLABUS**

EXPERIMENTS:

Part A:

1. Verification of Ohm's Law
2. Testing of DC starters – 3 point and 4 point starter
3. Load test on DC shunt motor
4. Testing of AC starters - DOL , star - Delta starter
5. Load test on single phase induction motor
6. Load test on three phase squirrel cage motor
7. Testing of relays, contactors, push buttons and limit switch
8. Connection and Testing of MCB, ELCB

Part B

9. Construction and testing of Half wave and Full wave rectifier.
10. Construction and testing of IC voltage regulator using IC 7805.
11. Verification of truth tables for logic gates.
12. Verification of universal gates.
13. Identification and testing of display devices- LED, 7 segment LED, Laser diode.
14. Testing of Stepper motor drive.
15. Testing of Servo motor drive.

Board Examination:

Note:

- All the experiments in both sections have to be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for

the batch strength before commencement of practical examination.

- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailed Allocation of Marks:

Part-A	45 marks
Circuit diagram	10
Connections & Readings	20
Calculations & Graph	15
Part-B	45 marks
Circuit diagram	10
Connections & Readings	20
Execution	15
Viva Voce	10
Total	100

LIST OF EQUIPMENTS (for a batch of 30 students)

Electrical Lab

1. DC ammeter 0-5A	-	1no
2. DC ammeter 0-25A	-	1no
3. DC voltmeter 0-30V	-	1no
4. DC voltmeter 0-300V	-	1no
5. Rheostat 10.8, 8.5A	-	1no
6. AC ammeter 0-5A	-	1no
7. AC ammeter 0-10A	-	2nos.
8. AC voltmeter 0-50V	-	3nos
9. AC wattmeter 5A-10A	-	3nos (0-750W,0-600V)
10. Loading rheostat 5A, 230V	-	1no
11. Tachometer 0-1000rpm	-	1no (Analog type)
12. Variac 20A, 250V	-	2nos (Auto transformer)
13. 3 point starter 20A, 220V	-	1no

14. DOL starter 16A,415V	-	1no
15. Star /Delta starter 20a,600V	-	1no
16. Over load relay 1 to 2.5A	-	1no
17. Air break contactors 20A,220V	-	4nos
18. Push button 2A ,220V	-	2nos
19. Limit switch 20A,220V	-	1no
20. MCB 20A single pole	-	1no
21. MCB 20A double pole	-	1no
22. ELCB 2pole 20A,100mA	-	1no
23. ELCB 4POLE 20A,100mA	-	1no

Electronics Lab

1. Transformer 230 / 9-0-9V, 1A	-	4 nos.
2. Resistor 1 KW / ½ W	-	3 nos.
3. Capacitor 1000 F/25V	-	4 nos.
4. IC 7805	-	1 no.
5. Logic Gates IC 7400, 7408, 7432, 7404, 7402, 7486	-	1 each
6. Stepper Motor Drive kit	-	1 no.
7. Servo Motor Drive Kit	-	1 no.
8. Digital Multi-meter	-	1 no.
9. LED, 7 Segment LED, Laser Diode-	-	1 each.

Blank page

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023510

Semester : V

Subject Title : **TRACTOR AND ITS POWER UNITS**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours /Semesters	Marks			Duration
Internal Assessment			Board Examination	Total		
4023510 Tractor And Its Power Units	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Introduction to tractor and engines	15
II	Fuel – air intake system	15
III	Other systems of an engine	15
IV	Power transmission system	15
V	Braking and hydraulic system	13
Test & Model Exam		7
Total		80

RATIONALE:

To effectively manage and produce from Agriculture one needs Power. Today, the agricultural sector faces severe labour shortages. To overcome these problems the use of mechanical power is essential. One who studies agricultural engineering must know the intricacies of mechanical power source namely Tractor.

To impart necessary skills in the field of Tractor and its Power units the corresponding practical's is offered along with theory subjects.

OBJECTIVES:

- To study and understand various components of a tractor.
- To understand the working principles of IC engines.
- To identify the physical differences between S.I. and C.I. engines.
- To observe different parts of I.C. engine and understand their working.
- To know about diesel engine and power transmission system.
- To understand the fuel-air intake system.
- To understand the cooling system of IC engine.
- To understand the Lubrication system.
- To understand the Braking and Hydraulic System.

4023510 TRACTOR AND ITS POWER UNITS
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>Introduction To Tractor And Engines</p> <p>1.1.1 Internal Combustion Engine: Tractor- types- classification and selection of tractors-Engine – introduction – classification of engine- Principle of Operation of IC engine –petrol engine and diesel engine – diesel cycle – valve timing diagram of diesel engine – Comparison of CI and SI engines. Basic terminologies of engine: Top dead centre- bottom dead centre- Bore and Stroke – Piston Displacement (Swept volume) – Compression ratio – Horsepower – IHP- BHP– drawbar power- Mean Effective Pressure – mechanical efficiency- Volumetric efficiency- Simple problems. Cylinder arrangements- Valve arrangements- Firing order- Firing Interval.</p> <p>1.2 Engine Components: Constructional Details of Engine, Cylinder, Cylinder head, gasket, cylinder liners, Piston- function of Piston , Piston rings, piston pins, combustion chambers, crank case, oil sump, connecting rod, crank Shaft, cam shaft, timing gear, Fly wheel, Engine bearing – Valve and Valve mechanisms- L-head valve- overhead valve- valve operation.</p>	15 Hrs
II	<p>Fuel - Air Intake System</p> <p>2.1 Fuel System: Fuel- Diesel engine fuel – requirement – properties – cetane number– diesel knock- preignition. Requirement of fuel injection system- Methods of fuel injection – direct injection – diesel engine fuel system layout –</p>	15 Hrs

	<p>components of fuel system – fuel tank – fuel filter (paper element) – A.C. Mechanic feed pump. Fuel injection Pump (general type) - fuel injectors (atomizer) – types of nozzles – bleeding of injection system. Governing System – purpose – pneumatic governor.</p> <p>2.2 Air Intake And Exhaust System: Pre-cleaner – air cleaner – types – wetted type, dry type and oil bath type – intake manifold – super charge-types – turbocharger. Exhaust system – exhaust manifold – exhaust pipe – mufflers – types (briefly)- scavenging- types.</p>	
III	<p>Other systems of an engine:</p> <p>3.1 Cooling System Of Ic Engine: Cooling system – need – methods of cooling - Air Cooling, Water Cooling, liquid cooling, steam cooling – Components of water Cooling system-servicing of cooling system.</p> <p>3.2 Lubrication System: Object of lubrication in IC engines – Function of Engine Oil – Properties of Lubricants – Types of lubricants – Lubricating parts – methods of lubrication – parts of lubricating system – pumps – oil filters – types oil strainer-oil cooler- oil level indicator – pressure gauge(only types) – Crank Case ventilation.</p> <p>3.3 Charging System: Starting motor (simple type) – alternator (general type) – cut out relay – starting and charging circuit – simple wiring diagram.</p> <p>3.4 Engine Maintenance: Engine trouble shooting and remedies- care and maintenance of cooling system- care and maintenance of lubricating system.</p>	15 Hrs
IV	<p>Power Transmission System:</p> <p>4.1 Clutch: Function – principles of Operation – Types of Clutches – Working of single Plate Clutch – Multi-plate clutch – clutch adjustment.</p>	15 Hrs

	<p>4.2 Gear Box: Gear box function – Types of gear box – sliding mesh – constant mesh – synchromesh – epicyclic gear box- Power take-off unit- belt pulley.</p> <p>4.3 Differential – function – construction and working – differential lock - back lash adjustment – final drive. Rear axle- types (briefly).</p> <p>4.4 Steering System: Requirement – function – steering geometries – steering gear box – cam and roller type, rack and pinion type, Re-circulating ball type – front axle – live and dead axle. Power steering (briefly) - stub axle- types- front axle assembly.</p>	
<p>V</p>	<p>5.1 Brakes: Classification of brakes – functions – mechanical brake – disc brake- Hydraulic brakes – master cylinder and wheel cylinder – bleeding of hydraulic brake system-brake adjustments.</p> <p>5.2 Tyres and Tubes: Tyres- types - Construction of Pneumatic tyre – tyre properties- size and Ply rating – Tubes.</p> <p>5.3 Hydraulic control System: Principles of hydraulics – basic components of hydraulic system- working of hydraulic system – implement control – position control – draft control – mixed position and draft control.</p> <p>5.4 Operation And Maintenance of A Tractor: Points to be noted before starting a tractor- precautions while operating a tractor- method of stopping a tractor- periodical maintenance of tractors- daily maintenance- hour basis maintenance- yearly maintenance- general precautions- cooling system- lubrication system- air cleaner system- fuel system- transmission system and wheels- hydraulic system- electrical system.</p>	<p>13 Hrs</p>

Text and References:

1. Elements of Agricultural Engineering- Dr.Jagdiswar Sahay
2. Farm maintenance – Maintenance and repair- S.C.Jain & C.R.Rai.
3. Automobile Engineering- R.B.Gupta
4. Automobile Engineering – Kripal Singh
5. Farm Tractor- C.P.Nakra

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023520

Semester : V

Subject Title : **FARM MACHINERY**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours /Semesters	Marks			Duration
Internal Assessment			Board Examination	Total		
4023520 Farm Machinery	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Primary tillage implements	15
II	Secondary tillage implements	14
III	Sowing and planting machines	15
IV	Plant protection equipments	15
V	Harvesting and threshing machines	14
Test & Model Exam		7
Total		80

RATIONALE:

Agricultural engineering is the study of applications of various branches of engineering in the field of agriculture with the aim of production maximization. Farm Machinery is one of the core subjects in the field of Agricultural engineering. Today, the field of agriculture is not liked by almost all laborers. Since agricultural activities are cumbersome and tiresome. To feed all the population in the universe we must carry on agriculture.

To do so we must mechanize agricultural activities like Ploughing, harvesting, threshing, plant protection etc,. There are a number of hindrance or constraints in mechanization like small land holding, cost of the equipment, lack of education etc,. To offset these problems one must study the various implements and equipments available and their operations must be thoroughly known. Since diploma level students are placed in maintenance, repair and service activities much importance is given to these areas of implements and equipments in this subject Farm Machinery.

OBJECTIVES:

- To study the constructional features of mould board plough, disc plough, subsoilers, operation, care and maintenance.
- To study on rotary tiller, components, power transmission and maintenance.
- Secondary tillage implements, different types of harrows and their operating procedures.
- Constructional features of seed drills-seed metering mechanisms.
- Calibration of seed drill.
- Study on constructional features of planters.
- Various types of sprayers-components.
- Different types of dusters-components.
- Harvesting machines-reapers-components.
- Threshing machines-different types-operations-care and maintenance.

4023520 FARM MACHINERY
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topic	Hours
I	<p>Primary Tillage Implements</p> <p>Tillage – objectives of tillage – classification and type of tillage – primary tillage & secondary tillage – types of plough – Indigenous plough – parts – mould board – plough Accessories – Adjustments of mould board plough – disc plough – advantages and disadvantages – types of disc plough – disc angle – Tilt angle – Scraper – concavity. Adjustments and Repairs of plough – other plough – chisel plough – Subsoiler – Rotary plough – Rotavator – Terms related to field performance of machines (definition only)</p>	15 Hrs
II	<p>Secondary Tillage Implements:</p> <p>Definition – Objectives – Harrow – Types – Disc Harrow – Classification – Constructional features – Operational techniques – Implement adjustment – operating procedure – Maintenance – Trouble shooting – Possible causes and possible remedies. Spike tooth harrow – Spring type harrows, Blade Harrows – power Harrow – Roller Harrow – Cultivators.</p>	14 Hrs
III	<p>Sowing and Planting Machines:</p> <p>Seed drill– Types of seed drill– Constructional features– Seed metering mechanism– Fluted Roller– Internal double run – Orifice type - cup type– fertilizer metering mechanism – Seed/ Fertilizer dropping unit – Furrow opener – calibration of seed drill– operation procedure– care and maintenance-precautions. Planters- method of planting-types of planters- constructional features- field operation and adjustment– special crop planters- potato planter- manual Rice</p>	15 Hrs

	Transplanter (only).	
IV	<p>Plant Protection Equipments</p> <p>Introduction – Physical classification of pesticides – classification of Sprayer – Types and sizes of sprayers – Stirrup pump sprayers - Bucket – Hand compression Sprayer – Foot Sprayer – Rocking Sprayers – Knapsack sprayers - Spraying volume –High volume, Low volume, ULV – Duster, Manually operated, plunger duster, Hand rotary duster, bellow duster, Power operated duster- Spinning disc applicator, thermal foggers – safety precautions – Troubles occurring in various plant protection equipments – selection of plant protection equipment.</p>	15Hrs
V	<p>Harvesting and Threshing Machines</p> <p>Thresher – Introduction – Working principle – Constructional features – Different types of feeding system – Types of power threshers –Drummy type – Hammer mill type - syndicator type - spike tooth type – wire loop type – Rasp bar type – Axial flow type – Multi-crop thresher. Installation – Adjustments in a thresher – Safety precautions Maintenance – Trouble shooting.</p> <p>Combine harvester – Self propelled tractor operated – functions of combined harvester – Construction features - cutter bar, Threshing unit – combine operation – combine performance – Maintenance.</p>	14 Hrs

Text book:

1) Farm Machinery – An approach Authors: S.C. Jain & Grace Philip.

Publisher: Standard Publishers, Distributors,1705,Nai Sarak, P.B.NO.1066, New Delhi.

Reference Books:

1) Principles of Agricultural Engineering, Vol. I, A.M. Michael & T.P. Ojha

2) Elements of Agriculture Engineering Dr. Jagdishwar Sahai, Agro Book Agency.

3) Principles of Farm machinery, R.A.Kepner, Roy Bainer, E.L.Berger.

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023531
Semester : V
Subject Title : **POST HARVEST TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours/ Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4023531 Post Harvest Technology	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Properties of grains	15
II	Drying	14
III	Parboiling	15
IV	Milling	15
V	Processing of oil seed and rice bran	14
Test & Model Exam		7
Total		80

RATIONALE:

Post harvest Technology is one of the core subject in Agricultural engineering study. There is a common feeling among farmers that their produce is not giving enough or good return to them. More over the post harvest losses are much higher. This leads to food shortages to the people. To adders all these issues Postharvest technology is studied.

Various techniques like value addition to the agricultural produce, drying and its importance, parboiling, milling, oil extraction are some of the ways by which the farmer can get more remunerative price to his produce.

OBJECTIVES:

- To understand the structure, physical and chemical properties of the various food grains. Understanding of this properties helps in design of processing machines and equipments
- To understand mechanism of drying and importance of drying
- To know the working of various dryers
- To understand the mechanism and importance of parboiling.
- To study the various parboiling techniques.
- To know the mechanism of milling and various milling machineries.
- To understand rice milling and modern rice milling concept.
- To know the extraction and refining of vegetable oils.
- To know the rice bran processing techniques.

4023531 POST HARVEST TECHNOLOGY

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topic	Hours
I	Properties Of Grains: Structure of a grain – chemical composition – effect of temperature on quality of grain. Physical Properties – thermal properties – mechanical properties. Humidity – percentage humidity – relative humidity – humid heat enthalpy – humid volume – saturated volume – dew point. Moisture Content – dry basis, wet basis – relation between them – simple problems – moisture measurements – different methods. Concept of equilibrium moisture content – determination EMC- Henderson's equation – simple problems.	15 Hrs
II	Drying: Thin Layer drying and deep bed drying – principles – constant rate of drying – falling rate of drying – need for drying – Newton's Equation for drying (MR). Factors affecting drying – different grain drying methods – conduction, convection and radiation – natural air drying, supplemental heat drying, heated air drying – other types of drying. Dryers – basics classification – unheated air dryers – heated air dryers – flat bed dryers – columnar dryers – re-circulatory batch dryer continuous flow columnar dryer – L.S.U. dryer – baffle type dryer – rotary dryer – advantages and disadvantages of dryers.	14 Hrs
III	Parboiling: Parboiling definition – principles of parboiling – Advantages	15 Hrs

	and Disadvantages of parboiling – soaking – steaming – drying – methods of parboiling – Traditional methods of parboiling – CFTRI methods – Kissan Continuous process – pressure parboiling – RPEC method – sodium chromate method – drying of parboiled paddy – Sun drying – mechanical drying.	
IV	<p>Milling:</p> <p>Definition – various milling processes – cleaning, grading and sorting – different types of separators – properties influencing separation. Husking/hulling of grains – method of husking.</p> <p>Grinding – Factors affecting grinding – grinding of grain in roller mills – grinding grain in hammer mill.</p> <p>Rice milling – Engelburg huller – advantages and disadvantages – Sheller – rubber roll sheller – advantages and disadvantages – polishing – vertical polisher- horizontal polisher.</p>	15 Hrs
V	<p>Processing Of Oil Seed And Rice Bran:</p> <p>Introduction – constituent of oils - classification of oils – their uses – extraction of oil from oil seeds – Extraction and refining of cotton seed oil – Extraction of soyabean oil – extraction of sunflower oil – extraction of palm oil – extraction of coconut oil – traditional method and mechanical extraction.</p> <p>Rice bran oil – composition of rice bran oil – problem faced in processing of rice bran oil – factors affecting storage of rice bran oil – extraction of the bran oil – solvent extraction and Batch extraction method – refining of crude rice bran oil – uses of bran oil and various constituents.</p>	14 Hrs

Reference Books:

- 1) Principles of Agricultural Engineering, Vol. I, A.M. Michael & T.P. Ojha.
- 2) Elements of Agriculture Engineering Dr. Jagdishwar Sahai, Agro Book Agency, New Chitragupta Nagar, Patna – 20.

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4020532
Semester : V
Subject Title : **GREEN ENERGY AND ENERGY CONSERVATION****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hour/ week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4020532 Green Energy And Energy Conservation	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

** Common with Mechanical Engineering.

Topics and Allocation of Hours:

Unit No.	Topic	Hours
I	Fundamentals of Energy, Geothermal energy, Wind energy	15
II	Bio mass energy, Solar Energy	15
III	Photovoltaic (PV)	15
IV	PV Technologies, Applications	14
V	Energy conservation	14
Test & Model Exam		7
Total		80

RATIONALE:

There is an ever increasing demand for energy in spite of the rising prices of oil & other fossil fuel / depletion of fossil fuels. Energy demand, in particular electricity production has resulted in creation of fossil fuel based power plants that let out substantial greenhouse gas / carbon emission into the atmosphere causing climate change and global warming. We have various forms of renewable energy sources viz., Wind, Solar, Biomass, Biogas, etc. Municipal and Industrial wastes could also be useful sources of energy while ensuring safe disposal. This subject is introduced to learn about the major renewable energy sources and more focus on the PV module solar energy. The government act and guidelines are discussed for the benefit of the Diploma Engineers.

OBJECTIVES:

- Study about the fundamentals of Energy.
- Study of construction and principle of Wind energy, Solar energy, Geo thermal and Bio energy.
- Understand the solar energy.
- Understand the PV design and its components.
- Study the energy conservation process.
- Understand the Government Policies and Acts.
- Study the TEDA projects in Tamil Nadu.

4020532 GREEN ENERGY AND ENERGY CONSERVATION DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	Fundamentals of Energy, Geothermal energy, Wind energy 1.1 Energy: Introduction – Energy need and trends - Forms of Energy- First Law of Thermodynamics - Second Law of Thermodynamics- energy requirement and supply – Fossil fuels and climate changes – need of renewable energy	15 Hrs

	<p>sources – Current renewable energy uses – Renewable energy policies in India.</p> <p>1.2 Geothermal energy: Introduction – Essential characteristic – Sources – Power Plants – Single flash power plant – double flash power plant – Flow diagram and principle only.</p> <p>1.3 Wind energy: Introduction – energy conversion – site selection considerations – Components of wind energy conversion system – Classification. Wind mill: Horizontal axis machines - Vertical axis machines – working principle, advantages and disadvantages. Schemes for electric generation.</p>	
II	<p>Bio mass energy, Solar Energy</p> <p>2.1 Bio mass energy: Introduction – conversion technologies: Wet processes – dry processes. Bio gas generation – factors affecting the bio gas generation – classification of bio gas plants – Bio gas plant – construction - advantages and disadvantages. Materials used for bio gas generation – factors to be considered for the selection of site.</p> <p>2.1 Solar Energy: Introduction – Sun’s energy: advantages – conversion challenges– The Sun-Earth movement - Solar radiation - Different angles - optimal angle for fixed collector, in summer and winter. Sun tracking - measuring instruments of solar radiation – methods to estimate solar radiation.</p>	15 Hrs
III	<p>Photovoltaic (PV)</p> <p>Photovoltaic (PV): Semiconductors as solar cell – types of unit cells - electronic arrangement of silicon atom – intrinsic semiconductor– extrinsic semiconductor – Description only. P-N junction diode- forward bias - reverse</p>	15 Hrs

	<p>bias. Solar cell - characteristics - description of short circuit current, open circuit voltage, fill factor and efficiency - losses in solar cells.</p> <p>Growth of solar PV and silicon (Si) requirement – production of metallurgical grade (MGS) – production of electronic grade (EGS)- Production of Si wafers: ingot making - monocrystalline - multicrystalline – wafer dicing. Si sheets. Solar grade silicon (SoG) - refining processes – Si usage in Solar PV. Process flow of commercial Si cell technology – Description of saw damage removal and surface texturing, diffusion process, thin-film layers for anti reflection coating and surface passivation, metal contacts and their deposition.</p>	
<p>IV</p>	<p>PV Technologies, Applications</p> <p>PV Technologies: Thin film Technologies – materials for thin film technologies – Thin film deposition techniques: Physical vapour deposition – Evaporation – Sputtering. Chemical vapour deposition – Low pressure – plasma enhanced. Advantages of thin film Si solar cell technologies. Solar cell structures – substrate arrangement – superstrate arrangement. Solar PV module: series and parallel connections of cells – mismatch in cell / module- Design and structure of PV module.</p> <p>Batteries for PV systems – factors affecting battery performance – DC to DC converters – Charge controllers – DC to AC converter (inverter) (Description only).</p> <p>Applications: Flat plate collector - concentrating solar collectors – solar pond – solar water heating – space heating and cooling – solar pumping – solar cooking – solar green house. principle and applications only.</p>	<p>14 Hrs</p>

V	<p>Energy conservation:</p> <p>Energy conservation act 2001 - Power of state government to facilitate and enforce efficient use of energy and its conservation - Finance, Accounts and Audit of bureau - Penalties and Adjudication - Appellate tribunal for energy conservation – Energy Conservation Guidelines for Industries by BEE, Govt of India - Guide lines – heating, cooling and heat transfer – waste recovery and usage – conversion of heat to electricity – Prevention of energy loss due to heat radiation and electric resistance – Industry energy management system. Net-metering policies – Tamil Nadu Energy Development Agencies – Projects in Tamil Nadu: Solar energy, Bio energy and Wind energy – Tamil Nadu Solar policy 2019.</p>	14 Hrs
----------	--	---------------

Reference Books

1. Non Conventional Energy Sources, G.D.Rai, Khanna Publishers.
2. Non Conventional Energy Sources and Utilisation, R.K.Rajput, S.Chand & Company Ltd.
3. Renewable Energy, Stephen Peake, Oxford press
4. Non Conventional Energy Resources, B.H.Khan, Tata Mc Graw Hill.
5. Industrial energyconservation- D. A. Ray- Pergaman Press
6. Energy resource management, Kirpal Singh Jogi, Sarup and sons.
7. Solar Photovltaics, Chetan Singh Solanki, PHI Learning Pvt. Ltd.
8. Renewable Energy Engineering and Technology, V V N Kishore, TERI.
9. Principles of Solar Engineering, D.Yogi Goswami, Frank Kreith, Jan F.Kreider, Taylor & Francis.
10. Energy conservation act 2001, Government of India.
11. Energy Conservation Guidelines for Industries, Bureau of energy Efficiency, Ministry of Power, Government of India.
12. Tamil Nadu Solar policy 2019
13. <https://teda.in/achievements/solar-energy-4/>

14. <https://teda.in/achievements/bio-energy-2/>

15. <https://teda.in/achievements/wind-energy-2/>

Board Examination- Question Paper Pattern

Time: 3 Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS N – SCHEME
 (Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
 : 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023533
Semester : V
Subject Title : **SUGARCANE CROP PRODUCTION**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4023533 Sugarcane Crop Production	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Introduction – sugarcane in India	15
II	Agronomy of sugarcane	15
III	Crop protection	15
IV	Mechanization in sugarcane cultivation	14
V	Extension methods	14
Test & Model Exam		7
Total		80

RATIONALE:

Sugarcane is one of the major crops in India. It requires less water than any other cash crops. The byproduct of sugarcane is alcohol which can be blended with petroleum product. This earns a good junk of foreign exchange.

OBJECTIVES:

- To study History and role of sugarcane in Indian Economy.
- To understand the potentials of sugar industry.
- To know the agro climatic condition of sugarcane crop.
- To know the field preparation and agronomical practice required for sugarcane crop.
- To understand the ratoon management practices
- Management of weeds, pest and disease
- To know the machines used in sugarcane crop farming
- To get firsthand experience in extension activities of sugarcane cultivation

4023533 SUGARCANE CROP PRODUCTION**DETAILED SYLLABUS****Contents: Theory**

Unit	Name of the Topics	Hours
I	Introduction – Sugarcane In India: History – role of Sugarcane in the national economy – Area Production and Productivities – Growth of sugar Industry – Sugarcane Research – Sugar factories – Sugar cane regions – Sugarcane by - products and scope for diversification of sugar industry.	15 Hrs
II	Agronomy Of Sugarcane: Sugarcane plant – Sugarcane growing seasons – varieties – land Preparation – soil fertility management – nursery – seed material – planting systems – intercropping – irrigation –	15 Hrs

	manuring – cultural operations -harvesting – sugar recovery – ratoon management operation .	
III	Crop Protection: Weed management – disease management – pest management – Management of sugarcane under stressed conditions.	15 Hrs
IV	Mechanization In Sugarcane Cultivation: Field preparation equipments – planter – intercultural operation implements – ratoon management operations implements – sprayers – mechanical cane harvesters.	14 Hrs
V	Extension Methods : Extension – Definition – Extension methods – direct contacts- Farm and home visits - Office calls – Personal letters – Observation plots- Result demonstration. Group contacts – Method demonstration - General meetings – Field trips. Mass contacts – Publications – Circular letters – News articles – Radio – Television. Field Visits – Factory Visits.	14Hrs

Reference Books:

1. Sugarcane Cultivation by B.Sundara Vikas Publishing House Pvt Ltd, 576, Majith road, Janpura, New Delhi.
2. Sugarcane technologies by K.Mohan Naidu, Kalakathir Achagam, Coimbatore
3. Technologies to improve Sugarcane Productivity by T.Rajulla Gowdari N. Vijaya Nair, Director, Sugarcane breeding institute, CBE.
4. Sugar cane at a glance by A.K. Srivastavs, International book distributing co., Chaman studio building ,Charbagh, Lucknow – 226004 UP, India.
5. Extension Education by A.Adivi Reddy, Shree Lakshmi Press, Bapatla – 522101 Guntur (District) AP, India.

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023540
Semester : V
Subject Title : **IRRIGATION ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours / week	Hours /Semester	Marks			Duration
Internal Assessment			Board Examinations	Total		
4023540 Irrigation Engineering	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Introduction to irrigation	15
II	Scheduling of irrigation and methods of irrigation	15
III	Canal irrigation system	14
IV	Hydrology, ground water exploration and soil plant water relationship	15
V	Water logging and land drainage	14
Test & Model Exam		7
Total		80

RATIONALE:

Water is a scarce commodity in the universe. Universe without water is not a place to live. One cannot grow crops without water. The water use efficiency is the main point in sharing river water across the countries. Judicial and efficient use of water becomes vital for the longevity of our mother earth.

This subject Irrigation Engineering aims to study about the sources of water and methods of water use effectively.

OBJECTIVES:

- To understand the basic of Irrigation engineering
- To understand the methods of irrigation and water quality.
- To know about the irrigation methods and sources of irrigation.
- To know about the plant-water- soil relationship.
- To understand about ground water and other water sources.
- To understand about application rate.
- To understand about water logging and drainage in land use.

4023540 IRRIGATION ENGINEERING
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>1.1 Introduction to irrigation: Definition – need for irrigation- factors affecting irrigation- Advantages and Disadvantages of irrigation – Types of Irrigation – different methods of Irrigation.</p> <p>1.2 Water requirement of Crops: Crop water requirement – Crop period or Base period – Duty and delta – Duty of water – Relationship between Duty and Delta – factors affecting duty – Importance of duty. Duty for certain Crops. Crop seasons – Crop Ratio - optimum utilization of Irrigation water – Irrigation efficiency- Consumptive Use or Evapo-transpiration (Cu)- Consumptive Irrigation Requirement (CIR), Net Irrigation Requirement(NIR), Factors affecting consumptive use- measurement of consumptive use -Tank (Lysimeter) experiment- field experiment plot- evaporation pan method-inflow-outflow method- Estimation of consumptive use- Blaney-Criddle Formula- Hargreaves class A pan evaporation method.</p> <p>1.3 Soil- Water- Plant Relationship: Soil- soil texture- effect of texture on irrigation- soil structure- effect of structure- specific gravity- porosity- effect of porosity- water movement in the soil- permeability- constant head permeameter- variable head permeameter- simple problems- infiltration- basic infiltration- accumulated infiltration- measurement of rate of infiltration- soil moisture- available moisture- soil moisture tension- field capacity- determination of field capacity- Permanent wilting point- determination of</p>	15 Hrs

	<p>permanent wilting point- and -available moisture-Readily available moisture-Soil moisture deficiency-Equivalent moisture.</p>	
II	<p>2.1 Irrigation Scheduling: Water need of a crop- optimum moisture- time of irrigation- quantity of water per application- gross water application- duration of application- frequency of irrigation- irrigation efficiencies- water conveyance efficiency- water application efficiency- water use efficiency- water distribution efficiency- water use efficiency- field irrigation efficiency- operational efficiency- economic irrigation efficiency.</p> <p>2.2 Conventional irrigation methods: Surface irrigation- uncontrolled flooding- controlled flooding- Border irrigation – check Basin Irrigation – Furrow irrigation.</p> <p>2.3 Micro Irrigation methods: Drip irrigation – Components – Pump, Motor, Filters, Main, Sub-main, Laterals, fertigation – Booster systems – design of Drip irrigation- Sprinkler irrigation system – Various types – Advantages and limitations – Components – Fertilizer applications – Moisture distribution pattern and uniformity of coverage – design of sprinkler irrigation system – operation and maintenance.</p>	15 Hrs
III	<p>Canal Irrigation system:</p> <p>3.1 Canals: Definition- classification of canals- canals on Alluvial and non – alluvial soils – Distribution system for Irrigation canals- main canal- branch canals- distributor canal- Alignment of canals – water shed canal – contour canal – side slope canal- cross section of canals.</p> <p>3.2 Losses in canals and Lining of canals: Losses in canals- evaporation loss- seepage loss.- Lining of</p>	14 Hrs

	<p>canals- purpose of lining- advantages of lining- disadvantages of lining- economics of lining. Types of lining- cement lining- hard surface lining- earth type lining- buried and protected membrane lining- low density poly ethylene lining- maintenance of lined canals.</p> <p>Methods of measurement of velocities in canals- surface float method- velocity rod method- current meter method- velocities using formulae- related definitions- Gross command area – cultivable command area – Intensity of Irrigation- Area to be irrigated. Determination of required channel capacity.</p>	
<p>IV</p>	<p>Hydrology, ground water exploration and soil plant water relationship:</p> <p>4.1 Hydrology:</p> <p>Definition – Hydrologic cycle – precipitation- forms of precipitation- causes of precipitation- conventional precipitation – orographic precipitation – cyclonic precipitation- Run-off - sources of run-off- factors affecting run-off. (Only factors and no need of explanation).</p> <p>4.2 Ground water</p> <p>Ground water- definitions-Aquifers, aquicludes, aquifuges- Types of aquifers – unconfined – confined – perched – water table- specific yield of wells- cone of depression- exploring the availability of ground water- methods of exploring of ground water- methods of tapping ground water- Artificial underground storage – methods of recharging - spreading method - Recharge well method- infiltration basin method- recharge through pits and shafts- recharge through wells. Infiltration wells – percolation ponds. Wells and their construction - Open wells and tube wells - Yields of an open well- confined and unconfined aquifer- tests for yield of a well- Pumping test – Recuperation test – sanitation of wells- Tube</p>	<p>15 Hrs</p>

	wells – various types of tube wells. Rain water harvesting- need for water conservation- methods- from roof- from open ground- advantages of rain water harvesting.	
V	<p>Water logging and land drainage:</p> <p>5.1 Water logging: Introduction- causes of water logging- ill effects of water logging- measures to prevent water logging- drainage of water logged area- investigation- advantages of drainage- types of drains- open drains- design and maintenance of open drain- methods of weed control in open drains- closed drains.</p> <p>5.2 land Reclamation: Reclamation of saline lands – Land drainage – Surface drainage – Sub-surface drainage – Surface inlets – French drains Bedding – Sub surface drainage or Tile drainage.</p>	14 Hrs

Reference Books

1. Irrigation Engineering and Hydraulic Structures Santhosh Kumar Garg, Khanna publishers - Delhi 110 006.
2. Irrigation Theory and Practice - A.M. Michael, Director (Retd.) Indian Agricultural Research Institute, Vikas Publishing house Pvt. Ltd.
3. Principles and Practice of Irrigation Engineering- S.K.SHARMA S.Chand &Company Ltd, Ram nagar, New Delhi-110055.

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023550
Semester : V
Subject Title : **TRACTOR AND ITS POWER UNITS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	4023550 Tractor And Its Power Units Practical	Hours / week	Hours /Semesters	Marks		
Internal Assessment				Board Examination	Total	
4 Hrs		64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

To effectively manage and produce from Agriculture one needs Power. Today, the agricultural sector faces sever labour shortages. To overcome these problems the use of mechanical power is essential. One who studies agricultural engineering must know the intricacies of mechanical power source namely Tractor.

To impart necessary skills in the field of Tractor and its Power units the corresponding practical's is offered along with theory subjects.

OBJECTIVES:

- To study and understand various components of a tractor
- To know about diesel engine and power transmission system.

- To study fuel-air intake system
- To study the cooling system of IC engine.
- To study Lubrication system
- To have a knowledge about Braking and Hydraulic System.

4023550 TRACTOR AND ITS POWER UNITS PRACTICAL
DETAILED SYLLABUS

Contents: Practical

LIST OF EXPERIMENTS AND ALLOCATION OF HOURS		
Exercise	Topics	Hours
	Cycle I (Engine)	
1	Engine dismantling and assembling	28
2	Valve timing of four stroke Diesel engine	
3	Venting of fuel system and servicing of fuel system (air lock releasing)	
4	Servicing of inlet and exhaust system (Pre cleaner, oil bath air cleaner, silencer cleaning).	
5	Servicing of cooling system (Flushing of Radiator)	
6	Servicing of Lubricating system.	
7	Servicing of starting motor and alternator.	
	Cycle II (Transmission system)	
8	Dismantling and assembling of Clutch system, Adjustment and Identification of Parts in Clutch system in a Tractor.	28
9	Dismantling and reassembling of Gear Box.	
10	Servicing of differential and backlash adjustments, differential lock (Briefly explain).	
11	Servicing of mechanical braking system and adjustments.	
12	Bleeding of hydraulic brake system.	

13	Servicing of steering system	
14	Rear wheel space adjustments, measuring of vehicle specifications.	
15	Workshop visit.	4
	Test and Revision	4
	Total	64

Note:

All the fifteen experiments given in the list of experiments should be completed and given for the end semester practical examination.

All the fifteen experiments must be completed and given for end semester practical examination.

The experiments should be conducted sequentially as per in the list.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

Duration of Examination: 3 Hours

Max Marks 75

Sl.No.	Item	Max.Marks 100	
		Cycle1	Cycle2
1	Aim and procedure	10	10
2	Sketch and description	10	10
3	Dismantling, assembling/ servicing	20	20
	Total	80	
4	Components Identification	10	
5	Report on commercial tractor Workshop	5	
6	Viva Voce	5	
	Total	100	

Board Examination-Question Paper Pattern

Part-A one question from engines and part-B one from transmission.

Part- C Identification of tractor parts, report on tractor work shop visit and viva voce.

LIST OF EQUIPMENTS (For a batch of 30 students)

1. Diesel engine.
2. Gear box.
3. Differential.
4. Braking system.
5. Steering system.
6. Tractor.
7. Spanner set and other tools.
8. Jack and other special tools.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023560

Semester : V

Subject Title : **MACHINE SHOP- II PRACTICAL**
(MILLING & GRINDING)

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Internal Assessment	Board Examinations	Total	
4023560 Machine Shop- II Practical (Milling & Grinding)	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

It is very much important to impart basic welding skills to the Diploma Engineer as it is one of the most important manufacturing and salvaging technique.

They should be given training to use both milling and grinding machines. The safety precautions should be taught to them. Practice should be given to maintain the milling and grinding machines. Basic skills in lathe should be given to Diploma Engineers.

Exposure to the working principles and various kinds of tools and methods of Turning, Drilling operations should be given.

OBJECTIVES:

- Identify a milling machine and its parts.
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder.
- Identify the tools and instruments used in milling.
- Handle the different types of work holding devices.
- Machine a component using different machine tools.
- Calculate the indexing for a work.
- Machine a gear using milling machine.
- Machine a cutting tool using Tool and Cutter grinder.
- Machine a plug gauge using Cylindrical grinding machine.

4023560 MACHINE SHOP- II PRACTICAL (MILLING & GRINDING)

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

1. Introduction to milling machine and its parts.
2. Introduction to grinding machine and its parts.
3. Introduction to work holding devices.
4. Types of cutter used in milling machine.
5. Types of grinding wheels used in grinding machines.
6. Setting of work, tools and cutters in milling and grinding machines.
7. Operation performed in milling and grinding machines.
8. Operation of milling and grinding machines.

Exercise

1. Prepare a square block from a round rod using milling.
2. Prepare a 'V' Block using Milling machine.
3. Prepare a Groove cut using Milling machine.
4. Prepare a Spur Gear using milling machine by Simple Indexing.
5. Prepare a Plug Gauge using Cylindrical Grinding machine.
6. Prepare Progressive type Plug gauge Progressive type Plug gauge using Cylindrical Grinding machine.
7. Prepare a Facing Tool using Tool and Cutter Grinder.
8. Prepare a plain surface using surface Grinder.
9. Prepare a Parting Tool using Tool and Cutter Grinder.

Note: Sketches enclosed. All dimensions in mm.

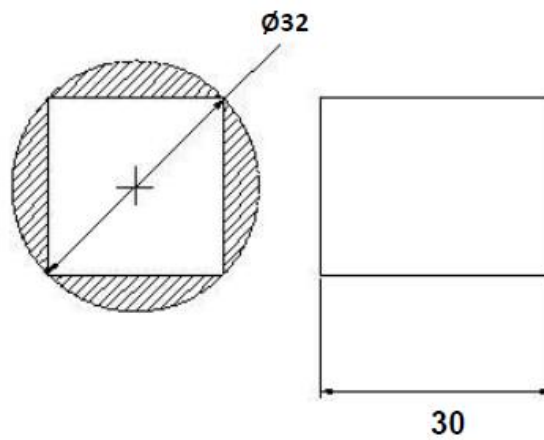
Note to the faculty: Last job of the raw material (MS Rod $\text{Ø}32 \times 33\text{mm}$, MS Rod $\text{Ø}25 \times 98\text{mm}$ and $13 \times 13 \times 75$ mm MS square rod) to be retained in student wise or batch wise .This may be verifiable at the time of Board Practical Examination by the external examiner.

All Linear dimensions are in ± 0.5 mm tolerance and all cylindrical dimensions ± 0.2 mm tolerance except grinding operation.

I MILLING:

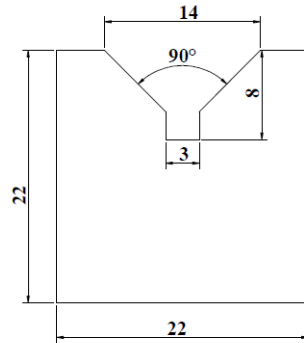
Exercise No: 1 Raw Material: $\text{Ø} 32 \times 33\text{mm}$ MS rod

Milling a maximum size of square block from a 32mm diameter round rod.



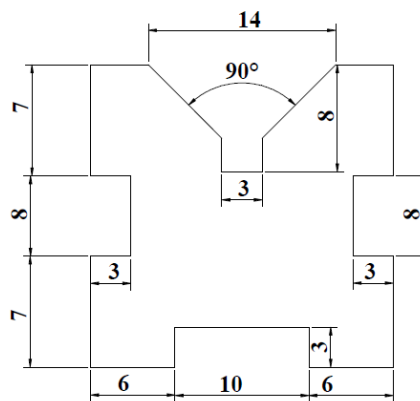
Exercise No: 2 'V' Block Milling

Raw Material: MS square block from exercise 1.



Exercise No: 3 - Groove Milling

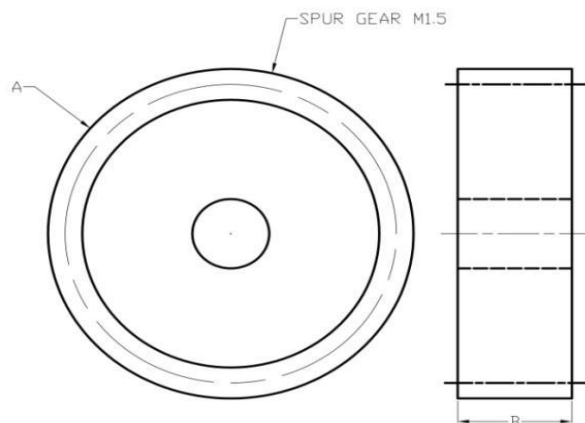
Raw Material: Exercise No: 2



Exercise No: 4- Spur Gear milling (Simple Indexing)

Raw Material: $\text{Ø } 32 \times 105$ mm MS rod.

Spur Gear, $Z=15, m=1.5$

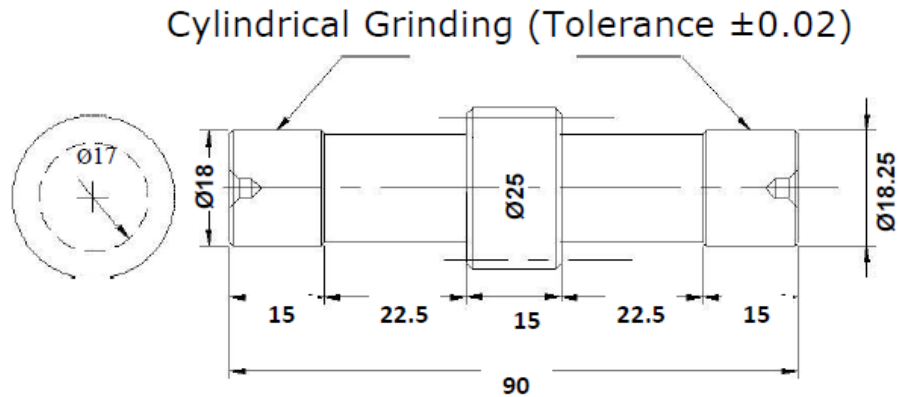


GRINDING

CYLINDRICAL GRINDING

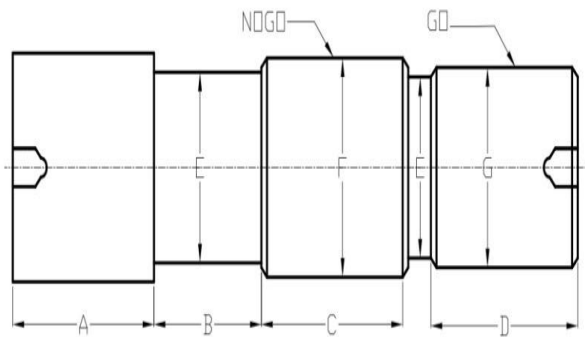
Exercise No: 5- Plug Gauge (Cylindrical Grinding)

Raw Material: Exercise No:4



Exercise No: 6- Progressive Plug Gauge (Cylindrical Grinding)

Raw Material: Exercise No:5



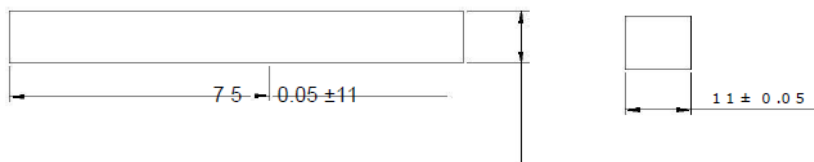
Surface Grinding

Exercise No 7- Surface Grinding

Raw Material: 13x13x75 mm MS square rod

Surface Grinding

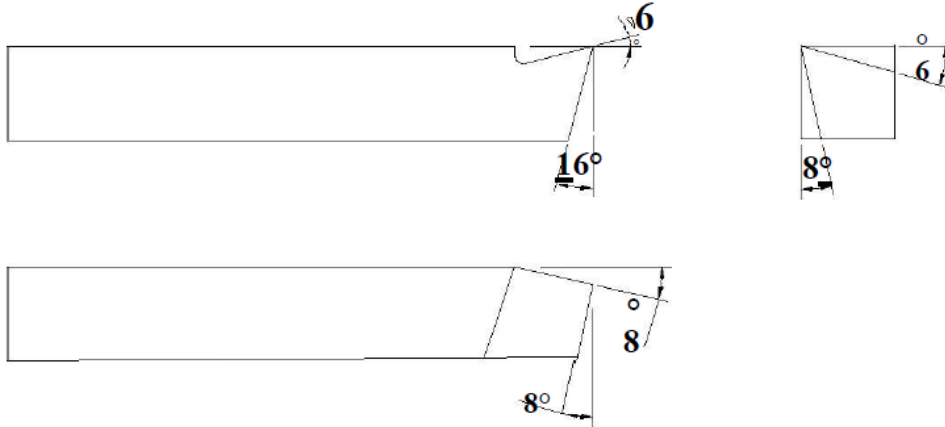
Tolerance for 11mm side is ± 0.05



TOOL AND CUTTER GRINDING

Exercise No: 8- Facing Tool (Tool and Cutter Grinder)

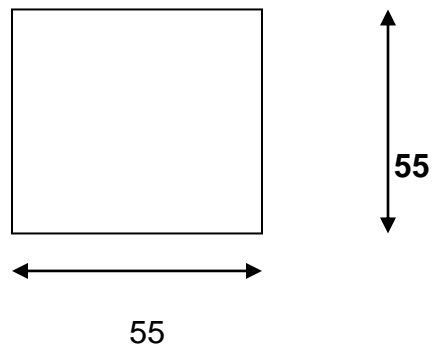
Raw Material: Exercise No: 7



SHAPING:

Exercise No:9

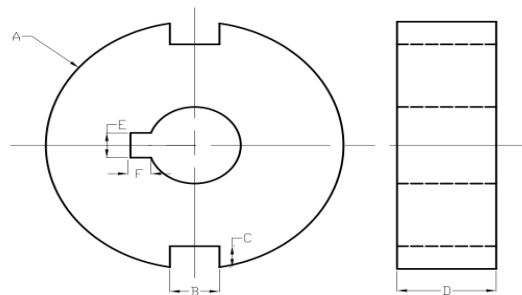
Make a cube using shaping machine.



SLOTTING:

Exercise No:10

Make a groove cut using slotting machine



BOARD EXAMINATION

Note:

- All the experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments/Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

DETAILED ALLOCATION OF MARKS

Duration of Examination: 3 Hours

Max Marks 100

Sl.No.	Item	Max. Marks 100
1	Job preparation and Marking	30
2	Setting and operation	40
3	Dimension and surface finish	25
4	Viva Voce	5
	Total	100

Board Examination-Question Paper Pattern

Note:

1. The dimensions can be given by the External Examiner based on the machineries and tools available.
2. Raw material – Mild steel or Cast iron
3. Exercises diagram is separately given in Annexure. The External Examiner is requested to take sufficient copies as per the requirement.

LIST OF EQUIPMENTS (For a batch of 30 students)

MACHINES:

1. Vertical milling machine/ vertical milling attachment in Universal Milling Machine – 2 No's
2. Universal Milling Machine with indexing head- 2 Nos
3. Surface Grinding Machine (Horizontal) – 1 No.
4. Cylindrical Grinding machine – 1 No.
5. Tool and Cutter grinder – 1 No.
6. Slotting machine - 1 no.
7. Shaping Machine – 1 no.

Equipments & Tools:

1. Milling Cutter (2 Module cutter) & accessories – complete sets
2. Milling Machine Handle and required accessories – 2 sets
3. Grinding wheel OD 150 mm , ID 1”(AA-65, K5, V8) – 2 No's
4. Grinding wheel OD 300 mm , ID 150mm(AA-56, K5, V8) – 1No.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4020570

Semester : V

Subject Title : **ENTREPRENEURSHIP & STARTUP****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
4020570 Entrepreneurship & Startup*	Hours/Week	Hours/Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

**Common with mechanical engineering.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Entrepreneurship – Introduction and Process	10
II	Business Idea and Banking	10
III	Start ups, E-cell and Success Stories	10
IV	Pricing and Cost Analysis	10
V	Business Plan Preparation	10
Revision, Field visit and Preparation of case study report		14
Total		64

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and start ups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVE:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non financial schemes
- Aware the concept of incubation and starts ups.

4020570 ENTREPRENEURSHIP & STARTUP

DETAILED SYLLABUS

Content: Practical

Unit	Name of the Topics	Hours
1	Entrepreneurship – Introduction and Process <ul style="list-style-type: none">● Concept, Functions and Importance● Myths about Entrepreneurship● Pros and Cons of Entrepreneurship● Process of Entrepreneurship● Benefits of Entrepreneur● Competencies and characteristics● Ethical Entrepreneurship● Entrepreneurial Values and Attitudes● Motivation● Creativity● Innovation● Entrepreneurs - as problem solvers● Mindset of an employee and an entrepreneur● Business Failure – causes and remedies● Role of Networking in entrepreneurship	10
2	Business Idea and Banking <ul style="list-style-type: none">● Types of Business: Manufacturing, Trading and Services.● Stakeholders: sellers, vendors and consumers and Competitors● E- commerce Business Models● Types of Resources - Human, Capital and Entrepreneurial tools and resources● Goals of Business; Goal Setting● Patent, copyright and Intellectual property rights	10

	<ul style="list-style-type: none"> ● Negotiations - Importance and methods ● Customer Relations and Vendor Management ● Size and capital based classification of business enterprises ● Role of financial institutions ● Role of Government policy ● Entrepreneurial support systems ● Incentive schemes for state government ● Incentive schemes for Central governments 	
3	<p>Start ups, E-cell and Success Stories</p> <ul style="list-style-type: none"> ● Concept of Incubation centre's ● Activities of DIC , financial institutions and other relevance institutions ● Success stories of Indian and global business legends ● Field Visit to MSME's ● Various sources of information. ● Learn to earn ● Startup and its stages ● Role of Technology – E-commerce and Social Media ● Role of E-Cell ● E-Cell to Entrepreneurship 	10
4	<p>Pricing and Cost Analysis</p> <ul style="list-style-type: none"> ● Calculation of Unit of Sale, Unit Price and Unit Cost. ● Types of Costs - Variable and Fixed, Operational costs. ● Break Even Analysis. ● Understand the meaning and concept of the term Cash Inflow and Cash Outflow ● Prepare a cash flow projection. ● Pricing and factors affecting pricing. ● Understand the importance and preparation of Income Statement 	10

	<ul style="list-style-type: none"> ● Launch Strategies after pricing and proof of concept. ● Branding- Business name, logo, tag line. ● Promotion strategy. 	
5	<p>Business Plan Preparation</p> <ul style="list-style-type: none"> ● Generation of Ideas. ● Business Ideas vs. Business Opportunities ● Selecting the Right Opportunity ● Product selection ● New product development and analysis ● Feasibility Study Report – Technical analysis, financial analysis and commercial analysis ● Market Research - Concept, Importance and Process ● Marketing and Sales strategy ● Digital marketing ● Social Entrepreneurship. ● Solving - Concept and Importance. ● Risk Taking-Concept ● Types of business risks. 	10

Note: (i) Unit 1, 2 & 3 contents are common for all diploma programs

(ii) Unit 4 & Unit 5 contents are optional; Conveners/HoDs are requested framing with their branch specific contents.

REFERENCE BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework , Sahitya Bhawan Publications, Agra - 282002
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301

4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
6. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
9. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
10. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

Board Examination – Evaluation Pattern

Internal Mark Allocation

Assignment (Theory portion)*	-	10
Seminar Presentation	-	10
Attendance	-	5
Total	-	25

Note: * Two assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelines for assignment:

First assignment – Unit1

Second assignment – Unit 2

Guidelines for Seminar Presentation- Unit 3

Each assignment should have five three marks questions and two five marks questions.

BOARD EXAMINATION

Note:

1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.
3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (45 Marks) and practical portions (55 Marks) should be completed for board examinations.
4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3Hrs.
5. For Written Examination: theory question and answer: 45 Marks
Ten questions will be asked for 3 marks each. Five questions from each unit 1 & 2. (10 X 3 = 30).
Three questions will be asked for 5 marks each. One question from each unit 1, 2 & 3. (3 X 5 = 15)
6. For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

DETAILED ALLOCATION OF MARKS

Sl. No	Description	Marks
Part A	Written Examination - Theory Question and answer (10 x 3 marks:30 marks) & (3 x 5 marks: 15 marks)	45
Part B	Practical Examination – Submission on Business Plan/Feasibility Report or Report on Unit 4 & 5	40
Part C	Viva voce	15
	Total	100

MODEL QUESTION PAPER

ENTREPRENEURSHIP AND START UPS

Part A

Time: 1 hour

Marks: 45

I. Answer ten questions in brief

(10x3=30)

1. Define entrepreneurship.
2. State the process of entrepreneurship
3. What are the benefits of being an entrepreneur?
4. How do entrepreneurs act as problem solvers?
5. Outline the role of networking in entrepreneurship.
6. List the various types of business
7. Outline the business model.
8. Suggest the various goals of business.
9. How selection of human resources is carried out?
10. Specify the role of government policy on entrepreneurship.

II. Answer three questions in details

(3x5=15)

11. Describe the importance of innovation on entrepreneurship.
12. Enumerate the various incentive schemes for the central government.
13. How technology will play a major role in E- commerce?

Part B

Practical Examination – Submission on Business Plan / Feasibility Report or
Report on Unit 4 & 5

Marks:40

PART C

Viva Voce

Marks:15

Blank page

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4020610
Semester : VI
Subject Title : **INDUSTRIAL ENGINEERING AND MANAGEMENT****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours/ Semester	Marks			
Internal Assessment			Board Examinations	Total		
4020610 Industrial Engineering And Management	6 Hrs	96Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

**Common with mechanical engineering.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Plant Engineering and Plant Safety	18
II	Work Study, Method Study and Work Measurement	18
III	Principles, Personnel Management and Organizational Behavior:	19
IV	Financial and Material Management	18
V	Engineering Ethics and Human Values	16
Test & Model Exam		7
Total		96

RATIONALE:

In the Indian Economy, Industries and Enterprises always find prominent place. After globalization, the students should be trained not only in manufacturing processes but also in managing activities of industries. The knowledge about plant, safety, work study techniques, personnel management and financial management will definitely mould the students as managers to suit the industries.

OBJECTIVES:

- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study production planning and control and its functions.
- To study basic and modern management techniques.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and it's behavior.

**4020610 INDUSTRIAL ENGINEERING AND MANAGEMENT
DETAILED SYLLABUS**

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>Plant Engineering and Plant Safety</p> <p>1.1 Plant Engineering : Plant – Selection of site of industry – Plant layout – Principles of a good layout – types – process, product and fixed position – techniques to improve layout – Principles of material handling equipment – Plant maintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance.</p> <p>1.2 Plant Safety: Importance –accident-causes and cost of an accident- accident proneness-prevention of accidents-Industrial disputes-settlement of Industrial</p>	18 Hrs

	disputes- Collective bargaining, conciliation, Mediation, arbitration-Indian Factories Act 1948 and its provisions related to health, welfare and safety.	
II	<p>Work Study, Method Study and Work Measurement</p> <p>2.1 Work Study: Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions.</p> <p>2.2 Method Study: Definition – Objectives – Selection of a job for method study –Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man machine chart, String diagram and flow diagram.</p> <p>2.3 Work Measurement: Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement-Ratio delay study, Synthesis from standard data, analytical estimating and Pre determined Motion Time System (PMTS).</p>	18 Hrs
III	<p>Principles, Personnel Management and Organizational Behavior:</p> <p>3.1 Principles of Management: Definition of management – Administration - Organization – F.W. Taylor’s and Henry Fayol’s Principles of Management – Functions of Manager – Directing – Leadership -Styles of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation -- Modern management techniques- Management Information Systems – Strategic management – SWOT Analysis -- Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) –Supply Chain Management (SCM)</p>	19 Hrs

	<p>– Activity Based Management (ABM) – Global Perspective – Principles and brief description.</p> <p>3.2 Personnel Management: Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages– Wage fixation – Type of wage payment – Halsey’s 50% plan, Rowan’s plan and Emerson’s efficiency plan – Problems.</p> <p>3.3 Organizational behavior: Definition – organization-- Types of Organization – Line, Staff, Taylor’s Pure functional types – Line and staff and committee type –Organizational Approaches, individual behavior—causes—Environmental effect—Behavior and Performance, Perception-organizational implications.</p>	
<p>IV</p>	<p>Financial and Material Management</p> <p>4.1 Financial Management: Fixed and working capital – Resources of capital – shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – direct cost – indirect cost – Factory overhead – Selling price of a product – Profit– Problems. Depreciation – Causes – Methods - Straight line, sinking fund and percentage on diminishing value method – Problems.</p> <p>4.2 Material management: Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level - Economic order quantity - problems – supply chain management Introduction –</p>	<p>18 Hrs</p>

	Purchasing procedure – Store keeping – Bin card.	
V	<p>Engineering Ethics and Human Values</p> <p>5.1 Engineering Ethics: Definition-engineering ethics- personal and business ethics- duties and rights- engineering as a profession – core qualities of professional practitioners-environment and their impact- code of ethics- procedure for solving ethical conflicts - ethical judgment- Kohiberg’s stages of moral development - value based ethics- engineers as managers, consultants and leaders- environmental ethics- computer ethics- Intellectual Property Rights (IPRs).</p> <p>5.2 Human values: Morals- values- integrity- service learning- civic virtue - respect for others- living peacefully- caring - sharing- honesty- courage - valuing time cooperation - commitments- empathy- self – confidence - character- stress management.</p>	16 Hrs

Reference Books:

1. Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications (P) Ltd – 2004, 67/4 Madras House, Daryaganj, New Delhi – 110002.
2. Engineering Economics and Management, T.R. Banga & S.C.Sharma, McGraw Hill Edition. 2 – 2001, New Delhi.
3. Herald Koontz and Heinz Wehrich, 'Essentials of Management', McGraw Hill Publishing Company, Singapore International Edition. Latest
4. Management, A global perspective, Heinz Wehrich, Harold Koontz, 10th Edition, McGraw Hill International Edition.Latest.
5. Essentials of Management, 4th Edition, Joseph L.Massie, Prentice-Hall of India, New Delhi 2004.
6. S.Chandran, Organizational Behaviours, Vikas Publishing House Pvt. Ltd.
7. M.Govindarajan and S.Natarajan, Principles of Management, Prentice Hall of India Pvt.Ltd. New Delhi.

Board Examination- Question Paper Pattern

Time: 3 Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4020532

Semester : VI

Subject Title : **COMPUTER INTEGRATED MANUFACTURING****

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject 4020532 Computer Integrated Manufacturing	Instruction		Examination			Duration
	hours/ week	Hours/ Semester	Marks			
Internal Assessment			Board Examination	Total		
	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

**Common with mechanical engineering.

Topics and Allocation of Hours

UNIT	Topic	Hours
I	Computer Aided Design	15
II	Computer Aided Manufacturing	14
III	CNC programming	16
IV	FMS, AGV, AS/RS, Robotics	14
V	Advanced concepts of CIM	14
Test & Model Exam		7
Total		80

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of Computer Aided Design and Manufacturing. They are able to operate CNC machines and write part program. They are able to understand the advanced concepts adopted in automated industries.

OBJECTIVES:

- Acquire knowledge in the field of Computer aided Design
- Explain the various concepts of Computer Aided manufacturing
- Write part program for manufacturing components in CNC machines
- Explain the concepts of automatic material handling and storage systems and robotics
- Explain the advanced concepts of CIM.

**4020532 COMPUTER INTEGRATED MANUFACTURING
DETAILED SYLLABUS**

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>Computer Aided Design: Computer Aided Design: Introduction – definition – Shigley’s design process – CAD activities – benefits of CAD - CAD software packages – point plotting, drawing of lines, Bresenham’s circle algorithm, Transformations: 2D & 3D transformations – translation, scaling, rotation and concatenation.</p> <p>Geometric modelling: Techniques - Wire frame modelling – applications – advantages and disadvantages. Surface modeling – types of surfaces – applications – advantages</p>	15 Hrs

	<p>and disadvantages – Solid modelling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison.</p> <p>Graphics standard: Definition – Need - GKS – IGES – DXF.</p> <p>Finite Element Analysis: Introduction – Development - Basic steps – Advantages.</p>	
II	<p>Computer Aided Manufacturing</p> <p>CAM – Definition - functions of CAM – benefits of CAM. Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM.</p> <p>Group technology: Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System. Process Planning: Introduction – Computer Assisted Process Planning (CAPP) – Types of CAPP - Variant type, Generative type – advantages of CAPP. Production Planning and Control (PPC): Definition – objectives - Computer Integrated Production management system – Master Production Schedule (MPS) – Capacity Planning – Materials Requirement Planning (MRP) – Manufacturing Resources Planning (MRP-II) – Shop Floor Control system (SFC) - Just In Time manufacturing philosophy (JIT)- Introduction to Enterprise Resources Planning (ERP).</p>	14 Hrs
III	<p>CNC Programming:</p> <p>NC in CAM, tolling for CNC – ISO designation for tooling – CNC operating system. Programming for CNC machining – part program - Manual part programming - coordinate system – Datum points: machine zero, work zero, tool zero - reference points - NC dimensioning – G codes and M codes – linear interpolation and circular interpolation - CNC</p>	16 Hrs

	<p>program procedure - sub-program – canned cycles - stock removal – thread cutting– mirroring – drilling cycle – pocketing. Rapid prototyping: Classification – subtractive – additive – advantages and applications – materials – Virtual machining.</p>	
IV	<p>FMS, AGV, AS/RS, Robotics:</p> <p>FMS: Introduction – FMS components – FMS layouts – Types of FMS: Flexible Manufacturing Cell (FMC) – Flexible Turning Cell (FTC) – Flexible Transfer Line (FTL) – Flexible Machining System (FMS) – benefits of FMS- introduction to intelligent manufacturing system.</p> <p>Material handling in CIM environment: Types – AGV: Introduction – AGV - working principle – types– benefits. AS/RS – working principle –types – benefits.</p> <p>Robotics: Definition – robot configurations – basic robot motion – robot programming method – robotic sensors – end effectors – mechanical grippers – vacuum grippers – robot programming concepts - Industrial applications of Robot: Characteristics - material transfer and loading – welding - spray coating - assembly and inspection.</p>	14Hrs
V	<p>Advanced Concepts Of CIM:</p> <p>Concurrent Engineering: Definition– Sequential Vs Concurrent engineering– need of CE – benefits of CE. Quality Function Deployment (QFD): Definition – House of Quality (HOQ) – advantages – disadvantages. Steps in Failure Modes and Effects Analysis (FMEA) – Value Engineering (VE) – types of values – identification of poor value areas – techniques – benefits. Guide lines of Design for Manufacture and Assembly (DFMA). Product Development Cycle: Product Life Cycle - New product development processes. Augmented Reality (AR) –</p>	14 Hrs

REFERENCES BOOKS:

1. R.Radhakrishnan, and S.Subramanian, “CAD/CAM/CIM”, New Age International Pvt. Ltd.
2. Mikell P.Groover, and Emory Zimmers, “CAD/CAM”, Jr.Prentice Hall of India Pvt., Ltd.
3. Dr.P.N.Rao, “CAD/CAM Principles and Applications,”, Tata Mc Graw Hill Publishing Company Ltd.
4. Ibrahim Zeid, “Mastering CAD/CAM”, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Mikell P. Groover, “Automation, Production Systems, and Computer-Integrated Manufacturing”, Pearson Education Asia.
6. Yoram Koren, “Computer control of manufacturing systems,”, McGraw Hill Book.
7. Chris McMahan and Jimmie Browne, “CAD/CAM – Principle Practice and Manufacturing Management”, Addison Wesley England, Second Edition,2000.
8. Dr.Sadhu Singh, “Computer Aided Design and Manufacturing,”, Khanna Publishers, New Delhi, Second Edition,2000.
9. S.Kant Vajpayee, “Principles of Computer Integrated Manufacturing,”, Prentice Hall of India, 1999.
10. David Bed worth, “Computer Integrated Design and Manufacturing,”, TMH, 1998.

Board Examination- Question Paper Pattern

Time: 3 Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING
Subject Code : 4023631
Semester : VI
Subject Title : **FOOD PROCESS ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
4023631 Food Process Engineering	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Unit operation in food processing & food standards	15
II	Egg, meat and fish processing	15
III	Milk processing	15
IV	Processing of vegetables and fruits	15
V	Beverages	13
Test & Model Exam		7
Total		80

RATIONALE:

The very need of the hour today in Agricultural Engineering and Technology is food processing. Only well processed items are edible and eligible not only for current use but also for storage for future requirements. So it is very essential for the students of this discipline to know about the technology of food processing. The technology not only provides defect free high quality and nutritious food items, but also enables storing of items for long time without any degradation in quality and nutritive values.

As Poultry, Fish, Vegetables, Fruits, Milk and Beverages are the main foods of one above items to the humankind, it is essential to impart the knowledge of processing of students of Agricultural Engineering.

The knowledge of the processing methods can meet the demand of the items during some serious situation like off seasons, natural calamity periods and the like. It also can help the students to become entrepreneur in this field. The knowledge is essential to avoid appreciable wastage and spoilage of valuable food items and get notable foreign exchange by exporting.

OBJECTIVES:

- To understand the various unit operations involved in food processing industry.
- To know the various food processing Techniques.
- To know the poultry processing, composition and its nutritive values.
- To know about the fish composition, nutritive value, preservation and storage.
- To know about the food additives.
- To know the various standards in food processing industry.
- To understand milk food processing and various types of Milk.
- To know about the processing of vegetables, its nutritive values and post harvest practices.
- To know about the preparation of Fruit Juice, Jelly and Jam.
- To know the processing of coffee and tea.

4023631 FOOD PROCESS ENGINEERING
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>Unit Operation In Food Processing</p> <p>Food Processing – Introduction – Types of Foods – Refining and Milling – Canning – Concentration – Freezing – Drying – Pasteurization and Sterilization – Fermentation – Irradiation – Packing (Brief introduction only).</p> <p>Food Preservation – Principles and methods – Importance of Food Preservation - Food Adulteration – Common adulterants and simple detection Techniques – Food Storages – (Cold Storage).</p>	15 Hrs
II	<p>Egg, Meat & Fish Processing & Food Standards</p> <p>Egg – structure – composition – nutritive value – effect of cooking – preservation of eggs – freezing – cold storage – drying – cooking of egg.</p> <p>Meat – structure – classes of meat – nutritive value – organ meats – composition – post mortem changes in meat – ageing of meat – tenderizing meat – curing of meat – cuts and grades of meat – smoking of meat – freezing of meat – cooking of meat.</p> <p>Poultry – classification – processing – composition and nutritive value – slaughter and bleeding – scalding – defeathering – canning – dehydration – chilling – freezing.</p> <p>Fish – classification – composition and nutritive value – selection – spoilage – factors – preservation and storage – cold storage – canning – chilling – freezing – curing – pickling or smoking – salting and drying.</p>	15 Hrs

III	<p>Milk Processing</p> <p>Procurement of Milk – Pricing of Milk – Chilling plant – Transportation – receiving Milk at Dairy plant – Quality evaluation – Organoleptic tests – sampling – laboratory tests for Milk – Detection of Adulterants – Bacteriological quality Tests. Processing of Milk – Methods of Pasteurization – HTST, Batch/Holding type and in bottle pasteurization – Sterilization in bottle and UHT methods – Bottling – Packaging caps and capping – storage and distribution, Marketing– Defects in Milk. Special Milks – standardized Milk, Toned Milk, Double Toned Milk, Homogenized milk, filled milk, condensed milk, Flavoured milk (Definition only).</p>	15 Hrs
IV	<p>Processing of Vegetables and Fruits</p> <p>Vegetables – Definition – classification – composition and nutritive values – selection – storage – post harvest practices – washing – skin removal – cutting and trimming – branching – canning – ascorbic acid dip – sulphur dioxide dip – sugar syrup – vacuum treatment – fruits – classification – composition and nutritive value – ripening- induced ripening of fruits – storage. Fruits for juice production – selection and preparation – juice preparation – jelly preparation – jam preparation.</p>	15 Hrs
V	<p>Beverages</p> <p>Definition – classification – ingredients – coffee processing – roasting – grinding – blending – brewing – decaffeinated coffee – instant coffee – extraction – dehydration – aromatization – methods of coffee making.</p> <p>Tea – leaf processing – black tea – green and oolong tea – instant tea – preparation of tea.</p>	13 Hrs

Reference Books:

1. Food science (Fifth edition) Norman N. POTTER, Joseph H. Hotchkiss
CBS Publishers & Distributors Pvt. Ltd. Chennai – 20, West park road,

Shenoy Nagar.

2. Food Science (Fourth Edition) B. Srilakshmi. New Age International (P) Ltd.
4835/24, Ansari road, Daryaganj. New Delhi 110002.

3. Chemical Process Industries. George T. Austin. McGraw Hill book company.

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X 15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023632

Semester : VI

Subject Title : **DAIRY ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4023632 Dairy Engineering	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Milk and its properties	15
II	Milk collection and handling	14
III	Quality evaluation	15
IV	Processing of milk	15
V	Special milks and milk products	14
	Revision & test	7
Total		80

RATIONALE:

The very need of the hour today in Agricultural Engineering and Technology is food processing. Only well processed items are edible and eligible not only for current use but also for storage for future requirements. So it is very essential for the students of this discipline to know about the technology of food processing. The technology not only provides defect free high quality and nutritious food items, but also enables storing of items for long time without any degradation in quality and nutritive values.

The knowledge of the processing methods can meet the demand of the items during some serious situation like off seasons, natural calamity periods and the like. It also can help the students to become entrepreneur in this field. The knowledge is essential to avoid appreciable wastage and spoilage of valuable food items and get notable foreign exchange by exporting.

OBJECTIVES:

- To understand the various properties of milk.
- To understand the ways of collection and handling of milk.
- To know about the quality of milk and its testing.
- To know about the various processing in milk.
- To know the various products in milk and types of milk.
- To understand milk food processing and various types of Milk.

4023632 DAIRY ENGINEERING DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	Milk and its Properties: Milk-definition- composition of milk- major constituents- minor constituents- physicochemical properties of milk- the physical state- acidity and pH of milk- specific gravity- boiling point- freezing point- refractive index- viscosity- colour and flavor.	15Hrs

II	Milk collection and handling: Procurement of milk- pricing of milk- chilling plant- transportation- receiving milk at dairy plant.	14 Hrs
III	Quality evaluation: Organoleptic tests- appearance- sedimentation- acidity- lactometer reading- COB test- alcohol test- sampling- lab test for milk- detection of adulteration- Bacteriological quality- direct microscopic count- standard plate count- coliform test.	15 Hrs
IV	Processing of milk: Receiving milk- Filtration/clarification- Standardization- Pearson's square method- problems- Pasteurization- Sterilization- homogenization- bottling/ packing- methods of pasteurization- HTST- batch type/ holding pasteurization- IN-bottle pasteurization- Ultra-high temperature short time pasteurization (UHT)- storage and distribution.	15Hrs
V	Special milks and milk products: Standardized milk- toned milk- double toned milk- homogenized milk- reconstituted milk- recombined milk- filled milk—condensed milk- flavoured milk. Cream- cream separation- cheese- preparation- ice cream preparation- milk powder preparation.	14 Hrs

Reference books:

1. Milk Production and Processing By C.Ibraheem Kutty and Sheeba Khamer – Daya Publishing House, N.Delhi-110035
2. Outlines of Dairy Technology – by Sukumar De, Oxford University Press
3. Milk and milk products – by Clarence Henry Eckles, Willes Barnes Combs, Harold Macy Tata Mc Graw- Hills Publishing Company Ltd, N.Delhi

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023633

Semester : VI

Subject Title : **MANUFACTURING ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4023633 Manufacturing Engineering	5 Hrs	80 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Foundry and heat treatment of ferrous metals	15
II	Forging and welding	15
III	Machine tool and machining process	15
IV	Milling and grinding machines	14
V	Press work & metal work finishing	14
Test & Model Exam		7
Total		80

RATIONALE:

The last one decade has witnessed a Phenomenal growth in manufacturing of Agro based Machineries and Equipments. Such machineries are being used extensively in all rural areas in farming operations like Ploughing, Harrowing, Planting, Harvesting etc., Now, Farmers are going with mechanized Agriculture at various stages of cultivation of food grains, Sugarcane etc.

It is very important to carry out service and repairs of such machineries even at rural areas; which has necessitated the Diploma Engineers to get to know with in-depth study on heat treatment of ferrous metals, welding, grinding processes in addition to the common conventional machine tools. Accordingly the syllabus is revised to fulfill the above requirements by a Diploma Engineer in the field of Agricultural Engineering and also for his career development as mechanically oriented Agricultural Engineer.

OBJECTIVES:

- Acquire knowledge about types of pattern, casting and moulding.
- Explain hot working and cold working processes.
- Describe the various casting processes.
- Appreciate the safety practices used in welding.
- Explain the working of a lathe and its parts.
- Describe the functioning of various types of drilling machines.
- Explain the working of shaping and milling machines.
- Classify the different types of grinders and grinder wheels.
- Explain the various types of metal work finishing.
- Explain the different types of press and press working operations.

4023633 MANUFACTURING ENGINEERING
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	<p>Foundry & heat treatment of ferrous metals</p> <p>Pattern – Pattern material – Types of Pattern – Pattern allowances – Cores – Types – Moulding – Moulding tools and boxes – Moulding sand – Properties – Preparation of green sand and dry sand moulds – Furnaces – Cupola and Crucible - Casting – Die casting – Malleable and chilled castings – Applications – Advantages, Disadvantages and limitations – Heat treatment of metals – annealing, hardening, Tempering – Surface heat treatment – types of case hardening – advantages – applications.</p>	15 Hrs
II	<p>Forging & welding</p> <p>Forging – cold working, Hot working, cold rolling , Hot rolling – classification of forging – smith forging – drop forging, machine forging, press forging, roll forging – advantages, disadvantages and Applications – Welding – Types of welding – welding equipment, Arc and Gas welding, advantages, disadvantages and applications - Flame cutting, soldering and brazing techniques – Advantages and applications, Types of welded joints – welding defects and testing of welded joints.</p>	15 Hrs
III	<p>Machine tools and machining process</p> <p>Lathe, types of lathe, specification of lathe, Centre lathe, Parts of a lathe – operations performed in a lathe – Taper turning and thread cutting operations only – Drilling machine – Types, Radial drilling machine, operation done on drilling. Shaper – principle of operation of a shaping</p>	15 Hrs

	machine – specifications – standard shaper – construction, - Quick return mechanism in shaper – Feed Mechanism	
IV	<p>Milling and grinding machines</p> <p>Milling Machine – Principle of operation – Types of Milling Machine – plain, Universal and vertical milling machines – Construction and working – work holding devices – Tools, Tool holding devices – Milling cutters – Types – Milling process – specification of a milling machine. Grinding Machines – Surface Grinder, Cylindrical grinder, - Centreless Grinders – Advantages, limitations – Standard marking system of grinding wheels, selection of grinding wheels, Glazing and loading of wheels. Dressing and truing of grinding wheel – wheel balancing and mounting of grinding wheels.</p>	14 Hrs
V	<p>Press work and metal work finishing</p> <p>Press working – types of presses – OBI press, adjustable bed press – Driving mechanism – Types – Hydraulic presses – comparison of Mechanical and hydraulic presses – Principle of operation and specification, capacity of a press, press tools and accessories – press Working operations – Bending and shearing operation. Metal work finishing – cleaning, degreasing, sand blasting, acid pickling, coating – anodizing, galvanizing, painting, metal spraying.</p>	14 Hrs

Reference Books:

1. Elements of workshop technology, Vol. I & II S.K Hajra choudhury S.K. Bose and A.K. Hajara choudhury
2. Production technology R. K. Jain.
3. Workshop technology part I & II W.B.J. Chapman
4. Foundry Engineering T.R. Banga, R.L. Agarwal, T.Manghnani

Board Examination- Question Paper Pattern

Time: 3Hrs.

Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions (7 + 8).

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023640

Semester : VI

Subject Title : **FARM MACHINERY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4023640 Farm Machinery Practical	6 Hrs	96 Hrs	25	100	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

RATIONALE:

Learning theory alone will not suffice for any engineering course. Skill development is one of the major objectives of the diploma program. To develop various operating and repair, maintenance and service skills on farm machinery the students are given with the farm machinery practical.

OBJECTIVES:

- To identify and understand the various components, operation, care and maintenance of primary tillage implements such as mould board plough and Disc plough.

- To identify and understand the various components, operation, care and maintenance of secondary tillage implements such as Disc harrow, Spike tooth harrow and Cultivators.
- To identify and understand the various components, operation, care and maintenance of seed drill and to do the calibration of a given seed drill.
- To understand safe operation, care and maintenance, Trouble shooting of various Plant protection equipments such as Sprayers and Dusters and to do Calibration of the Sprayer.
- To understand the various safety precautions, maintenance and Trouble shooting of Threshers.
- To drive the tractor and power tiller and to know the hitching and de-hitching of primary / secondary tillage implements with tractor three point hitch system.

4023640 FARM MACHINERY PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises:

1. Constructional features, Maintenance, Problems and Causes of Mould board Plough.
2. Constructional features, Maintenance, Trouble shooting and remedies of Disc Plough.
3. Operational procedure of ploughs.
4. Constructional features of Disc Harrow, Spike Tooth Harrow and Cultivators.
5. Constructional features of seed drill and its calibration .
6. Constructional features of various sprayers and their calibration .
7. Safety precautions, Maintenance, Trouble shooting and remedies of plant protection equipment.
8. Safety precautions, Maintenance, Trouble shooting and remedies of threshers
9. Driving practice of Tractor/Power tiller.
10. Hitching and de-hitching practice of mounted implements (3-point hitch)
11. Visit to nearby Farm Machinery Workshop.

12. Major farm machinery manufacturers in India data Collection (Library Visits)

BOARD EXAMINATION

Note:

All the twelve experiments must be completed and first ten only given for end semester practical examination. A batch of five students may be given an experiment, since the equipments are heavy in nature.

The external examiners are requested to ensure that single experimental question should not be given more than four students while admitting a batch of 30 students during board Examinations.

DETAILED ALLOCATION OF MARKS

1	Aim and Procedure	35
2	Tools used	10
3	Tractor / Power tiller operation	30
4	Identification of parts	10
5	Result	10
6	Viva-Voce	5
	Total	100

Board Examination-Question Paper Pattern

Part A – Student has to choose one question from all the exercises.

Part B- Identification of the parts for 10 marks.

Part C- Driving of tractor/ Power tiller and operations of implements 30 marks.

LIST OF EQUIPMENTS (For a batch of 30 students)

1. Mould Board Plough
2. Disc Plough
3. Disc Harrows
4. Seed Drills
5. Sprayers
6. Dusters
7. Reaper and Threshers.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME

(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : **4020561**

Semester : VI

Subject Title : **COMPUTER AIDED DESIGN AND MANUFACTURING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
4020561 Computer Aided Design And Manufacturing Practical	4 Hrs	64 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

*Common with mechanical engineering

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of Computer Integrated Manufacturing. They are able to write part program and able operate CNC lathe and Milling machines. They are able to understand the advanced concepts adopted in CIM.

OBJECTIVES:

- Acquire knowledge in the field of Computer Integrated Manufacturing
- Create 3D Solid models of machine components using modelling software

- Execute and perform machining operations in CNC Lathe and CNC Milling machines.

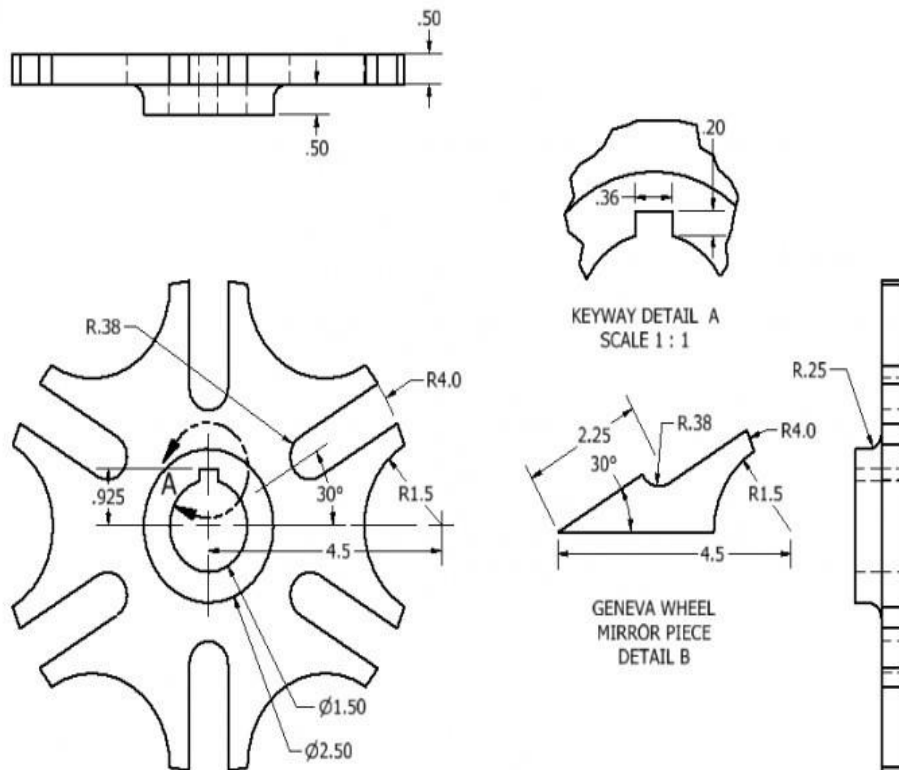
4020561 COMPUTER AIDED DESIGN AND MANUFACTURING PRACTICAL
DETAILED SYLLABUS

Contents: Practical

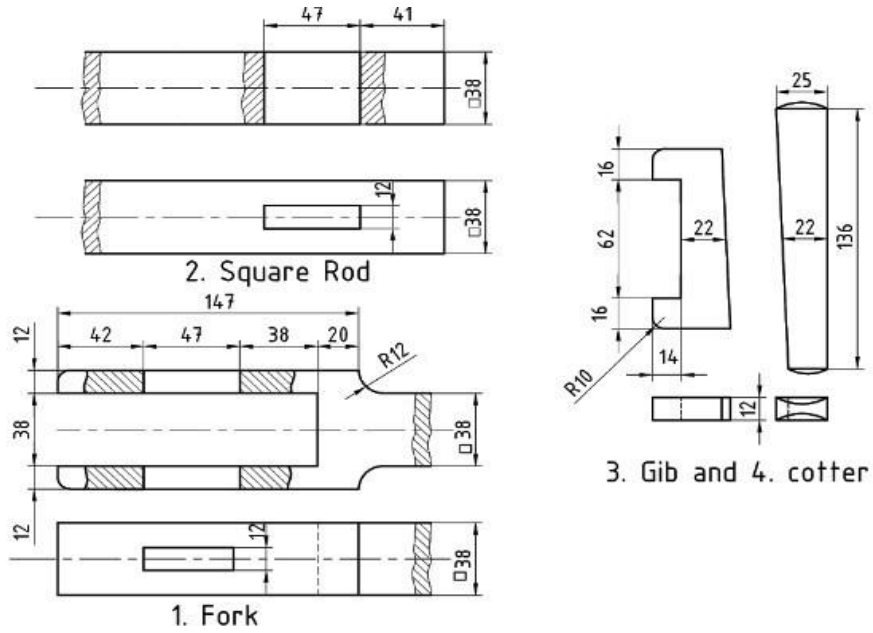
PART A: SOLID MODELLING

Introduction to Part modelling - Datum Plane – constraint – sketch – dimensioning – extrude – revolve – sweep – blend – protrusion – extrusion – rib – shell – hole – round – chamfer – copy – mirror – assembly – align – orient – drawing and detailing –creating assembly views.

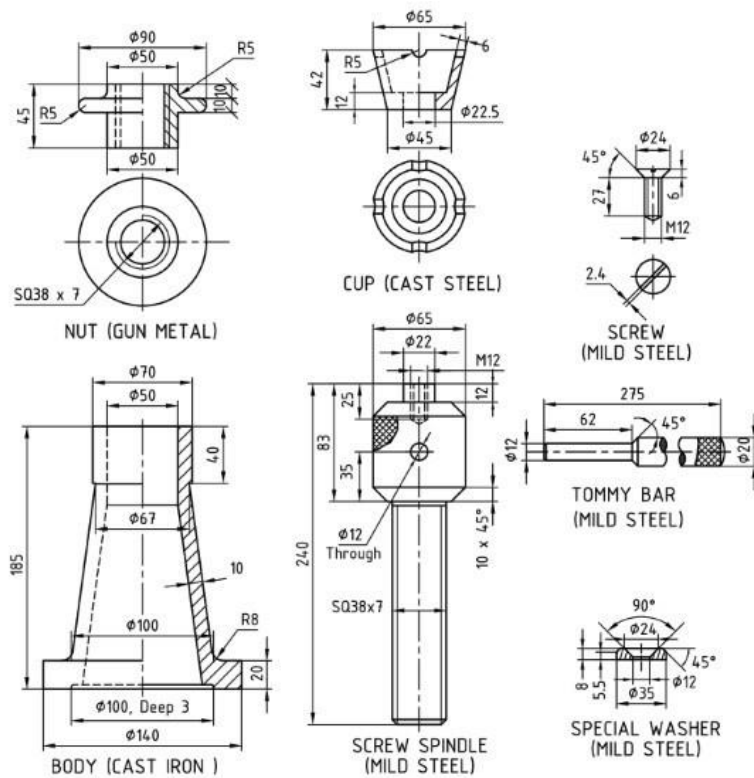
Exercise No. 1. Geneva Wheel



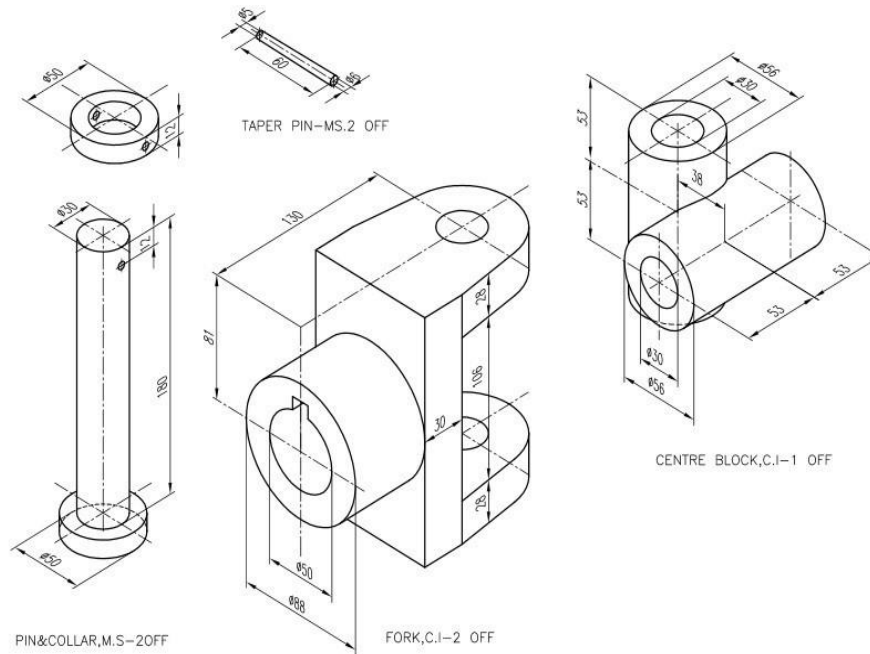
Exercise No. 4. Gib and Cotter joint



Exercise no.5: Screw Jack



Exercise No. 6. Universal Coupling



Note: Print the orthographic view and sectional view from the above assembled 3D drawing.

PART B: CNC Programming and Machining

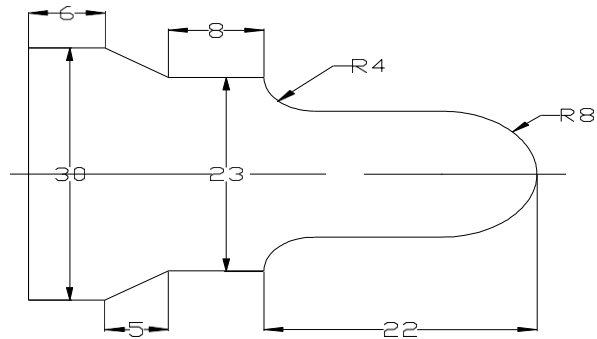
Introduction: 1. Study of CNC lathe, milling. 2. Study of international standard codes: G- Codes and M-Codes 3. Format – Dimensioning methods. 4. Program writing – Turning simulator – Milling simulator, IS practice – commands menus. 5. Editing the program in the CNC machines. 6. Execute the program in the CNC machines.

Exercises Note: Print the part program from the simulation software and make the component in the CNC machine.

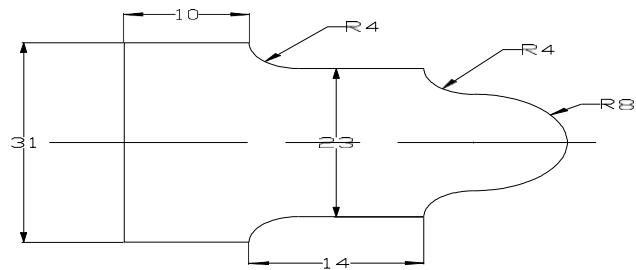
CNC Turning Machine

Material: M.S / Aluminium / Acrylic fibre / Plastic

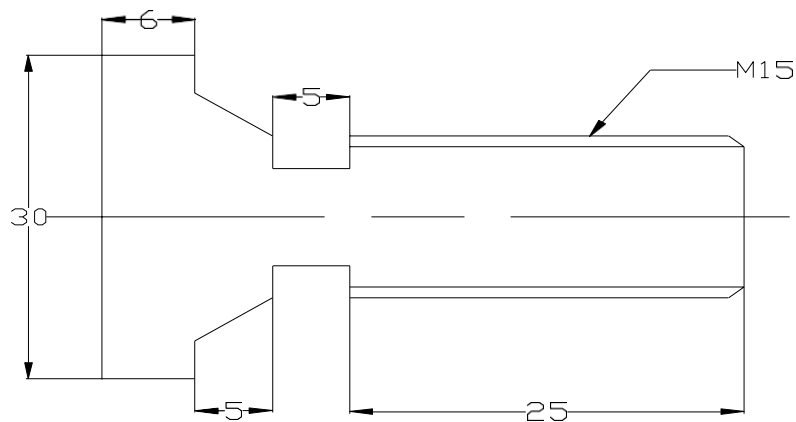
1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine.



2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine.



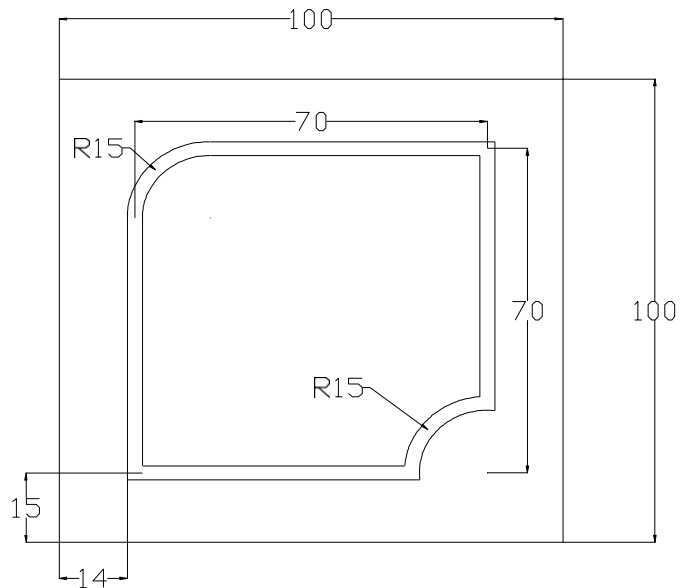
3. Using canned cycle - Create a part program for thread cutting, grooving and produce component in the Machine.



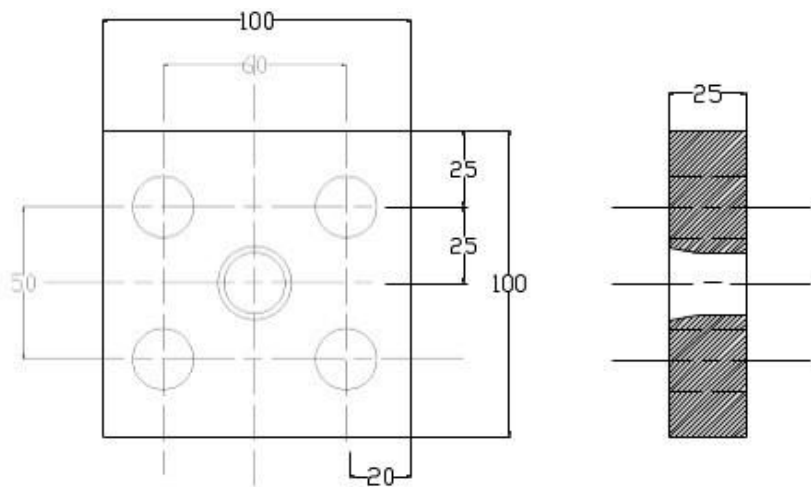
CNC Milling Machine

Material: M.S / Aluminum / acrylic fibre / plastic

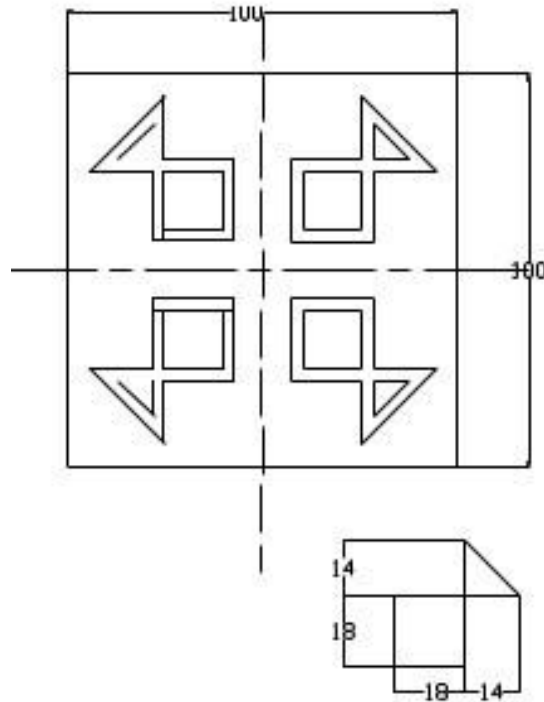
4. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.



5. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine.



6. Using subprogram - Create a part program and produce component in the Machine.



BOARD EXAMINATION

Note:

- All the exercises in both sections should be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the exercises should be given in the question paper and students are allowed to select by a lot or question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's /

equipment before commencement of practical examination.

Note: Part A – The given component drawing should be created and solid modelling after assembly should be printed and submitted along with the answer paper for evaluation by the external examiner.

Part B – The program for the given component should be written in the answer paper. The program should be entered in the CNC machine and the component should be submitted for evaluation by the external examiner. The machined component should be kept under custody of the examiner.

Allocation of marks for Board Examination

PART A: Solid Modelling

Creation of sketch	:	15
Modelling	:	25
Accuracy	:	5

PART B: CNC Programming

Program writing	:	15
Editing and Machining	:	25
Finish	:	5
Viva voce	:	10
Total Marks	:	100

LIST OF EQUIPMENTS

1. Personal computer - 30 Nos.
2. 3D Solid Modelling and Simulation software - Sufficient to the strength
3. CNC Lathe – 2 Nos.
4. CNC Mill – 2 Nos.
5. Consumables - Sufficient quantity
6. Laser / Inkjet Printer – 1 No.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N – SCHEME
(Implemented from the academic year 2020-2021 onwards)

Course Name : 1222- DIPLOMA IN AGRICULTURAL TECHNOLOGY
: 1023- AGRICULTURAL ENGINEERING

Subject Code : 4023660

Semester : VI

Subject Title : **PROJECT WORK AND INTERNSHIP[^]**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject 4023660 Project Work And Internship	Instruction		Examination			Duration
	Hours / week	Hours /Semester	Marks			
Internal Assessment			Board Examinations	Total		
	6 Hrs	96 Hrs	25	100*	100	3 Hrs

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

[^]Common with All engineering

RATIONALE:

This subject ‘Project Work and Internship’ is the continuation of the previous semester subjects. The students are to implement the detailed project plan, which they have prepared. This project are generally an integration of the various types of skills acquired during their course of study. Hence it is essential that students are given opportunity to develop and integrate the highly essential industry oriented competencies and skills. This subject builds up greater confidence to face in the world of work.

OBJECTIVES:

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment.
- Implement the planned activity as a team.
- Take appropriate decisions on collected information.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.

4023670 PROJECT WORK AND INTERNSHIP**Project Work and Internship:**

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise.

The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.

a) Internal assessment mark for Project Work & Internship:

Detail of assessment	Period of assessment	Max. Marks
First Review	6 th week	10
Second Review	12 th week	10
Attendance	Entire semester	5
Total		25

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Examination results. It should be

produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Internship in Board Examinations:

Details of Mark allocation	Max Marks
Demonstration/Presentation	25
Report	25
Viva Voce	30
Internship report	20
Total	100

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Board examination.
