

NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)

Erode-638 052, Tamil Nadu, India, Phone: 04294 – 225585



**Curriculum and Syllabi
for
B.E – Agriculture Engineering [R17]
[CHOICE BASED CREDIT SYSTEM]**

(This Curriculum and Syllabi are applicable to Students admitted from the academic year 2017-2018 onwards)

SEPTEMBER 2021

N. Jayaram

INSTITUTE VISION AND MISSION

VISION	<ul style="list-style-type: none"> • To be an institute of excellence providing quality Engineering, Technology and Management education to meet the ever-changing needs of the society.
MISSION	<ul style="list-style-type: none"> • To provide quality education to produce ethical and competent professionals with social Responsibility • To excel in the thrust areas of Engineering, Technology and Entrepreneurship by solving real- world problems. • To create a learner centric environment and improve continually to meet the changing global needs.

B.E – Agricultural Engineering

VISION	<ul style="list-style-type: none"> • To foster academic excellence by imparting knowledge in Agricultural Engineering to meet the ever-growing needs of the society.
MISSION	<ul style="list-style-type: none"> • To provide quality education to produce agricultural engineers with social responsibility. • To excel in the thrust areas of agricultural engineering to identify and solve the real-world problems. • To create a learner-centric environment by upgrading knowledge and skills to cater the needs and challenges of the society.
PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	<p>The graduates of Agricultural Engineering will be</p> <ul style="list-style-type: none"> • PEO1: Core Competency: Successful professional with core competency and interdisciplinary skills to satisfy the Industrial needs. • PEO2: Research, Innovation and Life-long Learning: Capable of identifying technological requirements for the society and providing innovative solutions to real time problems. • PEO3: Ethics, Human values and Entrepreneurship: Able to demonstrate ethical practices and managerial skills through continuous learning
PROGRAMME SPECIFIC OUTCOMES (PSO)	<p>The students of Agricultural Engineering will be able to</p> <ul style="list-style-type: none"> • PSO1: Design, analyze and apply the knowledge gained on agricultural machinery, tools, implements and production technologies to increase crop production, improve land use, soil nutrient and conserve resources like water, fertilizer and energy. • PSO2: Apply the comprehensive knowledge of engineering properties of agricultural products for upgrading the unit operation and developing innovative process, value-added products, and advanced engineering technologies to meet the challenges in Agriculture.

PROGRAM OUTCOMES:

At the end of a programme a student will be able to demonstrate

GRADUATE ATTRIBUTES	PO No.	PROGRAMME OUTCOMES
Engineering Knowledge	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
Problem Analysis	PO2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
Design and Development of Solutions	PO3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
Investigation of Complex Problems	PO4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
Modern Tool Usage	PO5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
The Engineer and Society	PO6	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
Environment and Sustainability	PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
Ethics	PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
Individual and Team Work	PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
Communication	PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Project Management and Finance	PO11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
Lifelong Learning	PO12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

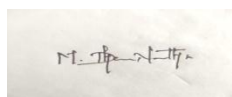
PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	3	2	3	3	1	2	1	1	1	1
2	3	3	3	3	2	2	2	2	2	1	1	2
3	3	3	3	2	3	2	2	2	2	1	1	1

Contribution

1: Reasonable

2: Significant

3: Strong



NANDHA ENGINEERING COLLEGE (AUTONOMOUS), ERODE – 638 052
REGULATIONS – 2017 (R17) CHOICE BASED CREDIT SYSTEM (CBCS)
B.E. AGRICULTURE ENGINEERING

CURRICULAM: I – VIII SEMESTERS

SYLLABUS: 1 TO 8 SEMESTERS

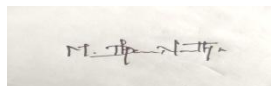
SEMESTER: I									
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17EYA01	Professional English – I	HS	-	4	2	0	2	3
2.	17MYB01	Calculus and Solid Geometry	BS	-	5	3	2	0	4
3.	17PYB01	Physics for Engineers	BS	-	3	3	0	0	3
4.	17CYB01	Applied Chemistry	BS	-	3	3	0	0	3
5.	17EEC01	Basic Electrical and Electronics Engineering	ES	-	3	3	0	0	3
6.	17CSC01	Problem Solving and Python Programming	ES	-	3	3	0	0	3
PRACTICAL									
7.	17GYP01	Physics and Chemistry Laboratory	BS	-	4	0	0	4	2
8.	17CSP01	Problem Solving and Python Programming Laboratory	ES	-	4	0	0	4	2
9.	17GEP01	Personal Values	HS	-	2	0	0	2	0
TOTAL					31	17	2	12	23
SEMESTER: II									
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17EYA02	Professional English – II	HS	17EYA01	4	2	0	2	3
2.	17MYB02	Complex Analysis and Laplace Transforms	BS	17MYB01	5	3	2	0	4
3.	17CYB03	Environmental Science	BS	-	3	3	0	0	3
4.	17AGC01	Principles and Practices of Crop Production	PC	-	3	3	0	0	3
5.	17MEC01	Engineering Graphics	ES	-	4	2	2	0	3
6.	17MEC02	Engineering Mechanics	ES	-	5	3	2	0	4
PRACTICAL									
7.	17AGP01	Crop Production and Husbandry Laboratory	PC	-	4	0	0	4	2
8.	17GYP02	Engineering Practices Laboratory	ES	-	4	0	0	4	2
9.	17GEP02	Interpersonal Values	HS	17GEP01	2	0	0	2	0
TOTAL					34	16	6	12	24

SEMESTER: III									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17MYB03	Fourier series and Partial Differential Equation	BS	-	4	2	2	0	3
2.	17AGC02	Soil Science and Engineering	PC	-	4	2	0	2	3
3.	17AGC03	Fluid Mechanics and Hydraulics	PC	-	4	4	0	0	4
4.	17AGC04	Surveying and Levelling	ES	-	3	3	0	0	3
5.	17AGC05	Mechanics of Farm Machines	PC	-	4	2	2	0	3
6.	17AGC06	Thermodynamics for Agricultural Engineers	ES	-	4	2	2	0	3
PRACTICAL									
7.	17AGP02	Surveying and Levelling Laboratory	ES	-	4	0	0	4	2
8.	17AGP03	Fluid Mechanics and Hydraulics Laboratory	PC	-	4	0	0	4	2
9.	17GED01	Soft Skills – Listening and Speaking	EEC	-	2	0	0	2	0
TOTAL					33	15	6	12	23
SEMESTER: IV									
SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17MYB06	Statistics and Numerical Methods	BS	-	4	2	2	0	3
2.	17AGC07	Heat and Mass Transfer for Agricultural Engineers	PC	17AGC06	4	2	2	0	3
3.	17AGC08	Crop Process Engineering	PC	-	3	3	0	0	3
4.	17AGC09	Farm Tractor Systems	PC	17AGC05	3	3	0	0	3
5.	17AGC10	Hydrology and Water Resources Engineering	PC	17AGC03	4	2	2	0	3
6.	17AGC11	Mechanics of Materials	ES	-	4	2	2	0	3
PRACTICAL									
7.	17AGP04	Crop Process Engineering Laboratory	PC	-	4	0	0	4	2
8.	17AGP05	Farm Tractors and Engines Laboratory	PC	-	4	0	0	4	2
9.	17GED02	Soft Skills – Reading and Writing	EEC	-	2	0	0	2	0
10.	17GED03	Personality and Character Development	EEC	-	2	0	0	2	0
TOTAL					34	14	8	12	22

SEMESTER: V									
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17AGC12	Unit Operations in Agricultural Processing	PC	17AGC08	3	3	0	0	3
2.	17AGC13	Farm Implement and Equipment	PC	17AGC09	4	2	0	2	3
3.	17AGC14	Irrigation and Drainage Engineering	PC	17AGC10	3	3	0	0	3
4.	17AGC15	Bio and Thermo- chemical Conversion of Biomass	PC	-	3	3	0	0	3
5.	E – 1	Elective – I (PSE)	PSE	-	3	3	0	0	3
6.	E – 2	Elective – II (PSE)	PSE	-	3	3	0	0	3
PRACTICAL									
7.	17AGP06	Unit Operations in Agricultural Processing Laboratory	PC	-	4	0	0	4	2
8.	17AGP07	Irrigation and Drainage Engineering Laboratory	PC	-	4	0	0	4	2
9.	17GED07	Constitution of India	EEC	-	2	2	0	0	0
TOTAL					29	19	0	10	22
SEMESTER: VI									
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17AGC16	Plant Protection and Harvesting Machinery	PC	17AGC13	3	3	0	0	3
2.	17AGC18	Design of Micro Irrigation System	PC	17AGC14	4	2	2	0	3
3.	E – 3	Elective – III (PSE)	PSE	-	3	3	0	0	3
4.	E – 4	Elective – IV (PSE)	PSE	-	3	3	0	0	3
5.	E – 5	Elective – V ((PSE/OE)	PSE/OE	-	3	3	0	0	3
6.	E – 6	Elective – VI (PSE/OE)	PSE/OE	-	3	3	0	0	3
PRACTICAL									
7.	17AGP08	CAD for Agricultural Engineering	PC	17AGC13	4	0	0	4	2
8.	17AGP09	Drawing of Farm Structures	PC	17AGC13	4	0	0	4	2
9.	17GED08	Essence of Indian Traditional Knowledge	EEC	-	2	2	0	0	0
10.	17GED06	Comprehension	EEC	-	2	0	0	2	0
TOTAL					31	19	2	10	22

SEMESTER: VII									
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	17AGC17	Protected Cultivation	PC	17AGC01	3	3	0	0	3
2.	17AGC19	Food and Dairy Engineering	PC	17AGC12	3	3	0	0	3
3.	17AGC20	Testing and Management of Farm Machinery	PC	17AGC13	3	3	0	0	3
4.	17AGC21	Remote Sensing and GIS for Agricultural Engineers	PC	17AGC04	4	2	0	2	3
5.	E – 7	Elective – VII (OE)	OE	-	3	3	0	0	3
PRACTICAL									
6.	17AGP10	Food and Dairy Engineering Laboratory	PC	-	4	0	0	4	2
7.	17AGP11	Operation and Maintenance of Farm Machinery Laboratory	PC	17AGP05	4	0	0	4	2
8.	17AGP12	Industrial Training (4 weeks)	EEC	-	0	0	0	0	1
9.	17AGD01	Project Work – I	EEC	-	8	0	0	8	4
TOTAL					32	14	0	18	24
SEMESTER: VIII									
SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1.	E – 8	Elective – VIII (PSE)	PSE	-	3	3	0	0	3
2.	E – 9	Elective – IX (OE)	OE	-	3	3	0	0	3
PRACTICAL									
3.	17AGD02	Project Work – II	EEC	-	16	0	0	16	8
TOTAL					22	6	0	16	14

TOTAL No. OF CREDITS: 174



B.E. AGRICULTURE ENGINEERING

(A) HS, BS, and ES Courses										
(a) Humanities and Social Sciences (HS)										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C	P. S
1.	17EYA01	Professional English-I	HS	-	4	2	0	2	3	I
2.	17GEP01	Personal Values	HS	-	2	0	0	2	0	I
3.	17EYA02	Professional English-II	HS	17EYA01	4	2	0	2	3	II
4.	17GEP02	Internal Personal Values	HS	17GEP01	2	0	0	2	0	II
(b) Basic Sciences (BS)										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C	P. S
1.	17MYB01	Calculus and Solid Geometry	BS	-	5	3	2	0	4	I
2.	17PYB01	Physics for Engineers	BS	-	3	3	0	0	3	I
3.	17CYB01	Applied chemistry	BS	-	3	3	0	0	3	I
4.	17GYP01	Physics and Chemistry Laboratory	BS	-	4	0	0	4	2	I
5.	17MYB02	Complex Analysis and Laplace Transforms	BS	17MYB01	5	3	2	0	4	II
6.	17CYB03	Environmental Science	BS	-	3	3	0	0	3	II
7.	17MYB03	Fourier series and Partial Differential Equation	BS	-	4	2	2	0	3	III
8.	17MYB06	Statistics and Numerical Methods	BS	-	4	2	2	0	3	IV
(c) Engineering Sciences (ES)										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	17EEC01	Basic Electrical and Electronics Engineering	ES	-	3	3	0	0	3	I
2.	17CSC01	Problem Solving and Python Programming	ES	-	3	3	0	0	3	I
3.	17CSP01	Problem Solving and Python Programming Laboratory	ES	-	4	0	0	4	2	I
4.	17MEC01	Engineering Graphics	ES	-	4	2	2	0	3	II
5.	17MEC02	Engineering Mechanics	ES	-	5	3	2	0	4	II

6.	17GYP02	Engineering Practices Laboratory	ES	-	4	0	0	4	2	II
7.	17AGC04	Surveying and Levelling	ES	-	3	3	0	0	3	III
8.	17AGC05	Mechanics of Farm Machines	ES	-	4	2	2	0	3	III
9.	17AGC06	Thermodynamics for Agricultural Engineers	ES	-	4	2	2	0	3	III
10.	17AGP02	Surveying and Levelling laboratory	ES	-	4	0	0	4	2	III
11.	17AGC11	Mechanics of Materials	ES	-	4	2	2	0	3	IV

(B) Programme Core Courses (PC)										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRERQUISITE	CONTACT PERIODS	L	T	P	C	P. S
1.	17AGC01	Principles and Practices of Crop Production	PC	-	3	3	0	0	3	II
2.	17AGP01	Crop Production and Husbandry Laboratory	PC	-	4	0	0	4	2	II
3.	17AGC02	Soil Science and Engineering	PC	-	4	2	0	2	3	III
4.	17AGC03	Fluid Mechanics and Hydraulics	PC	-	4	4	0	0	4	III
5.	17AGP03	Fluid Mechanics and Hydraulics Laboratory	PC	-	4	0	0	4	2	III
6.	17AGC07	Heat and Mass Transfer for Agricultural Engineers	PC	17AGC06	4	2	2	0	3	IV
7.	17AGC08	Crop Process Engineering	PC	-	3	3	0	0	3	IV
8.	17AGC09	Farm Tractor Systems	PC	17AGC05	3	3	0	0	3	IV
9.	17AGC10	Hydrology and Water Resources Engineering	PC	17AGC03	4	2	2	0	3	IV
10.	17AGP04	Crop Process Engineering Laboratory	PC	-	4	0	0	4	2	IV
11.	17AGP05	Farm Tractors and Engines Laboratory	PC	-	4	0	0	4	2	IV
12.	17AGC12	Unit Operations in Agricultural Processing	PC	17AGC08	3	3	0	0	3	V
13.	17AGC13	Farm Implement and Equipment	PC	17AGC09	4	2	0	2	3	V
14.	17AGC14	Irrigation and Drainage Engineering	PC	17AGC10	3	3	0	0	3	V

15.	17AGC15	Bio and Thermo-chemical Conversion of Biomass	PC	-	3	3	0	0	3	V
16.	17AGP06	Unit Operations in Agricultural Processing Laboratory	PC	-	4	0	0	4	2	V
17.	17AGP07	Irrigation and Drainage Engineering Laboratory	PC	-	4	0	0	4	2	V
18.	17AGC16	Plant Protection and Harvesting Machinery	PC	17AGC14	3	3	0	0	3	VI
19.	17AGC18	Design of Micro-irrigation System	PC	17AGC14	4	2	2	0	3	VI
20.	17AGP08	CAD for Agricultural Engineering	PC	17AGC13	4	0	0	4	2	VI
21.	17AGP09	Drawing of Farm Structures	PC	17AGC13	4	0	0	4	2	VI
22.	17AGC17	Protected Cultivation	PC	17AGC01	3	3	0	0	3	VI
23.	17AGC19	Food and Dairy Engineering	PC	17AGC12	3	3	0	0	3	VII
24.	17AGC20	Testing and management of Farm Machinery	PC	17AGP05	3	3	0	0	3	VII
25.	17AGC21	Remote Sensing and GIS for Agricultural Engineers	PC	-	4	2	0	2	3	VII
26.	17AGP10	Food and Dairy Engineering Laboratory	PC	-	4	0	0	4	2	VII
27.	17AGP11	Operation and Maintenance of Farm Machinery Laboratory	PC	17AGP05	4	0	0	4	2	VII

(C) Elective Courses

(a) Program Specific Electives (PSE)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C
1.	17AGX01	Design of Agricultural Machinery	PSE	-	3	3	0	0	3
2.	17AGX05	Refrigeration and Air Conditioning for Agricultural Engineers	PSE	-	3	3	0	0	3
3.	17AGX06	Packaging and Storage Techniques for Agricultural	PSE	-	3	3	0	0	3

		Commodities								
4.	17AGX10	Mechanics of Tillage and Traction	PSE	-	3	3	0	0	3	
5.	17AGX11	Special Farm Equipment	PSE	-	3	3	0	0	3	
6.	17AGX13	Sustainable Agriculture	PSE	-	3	3	0	0	3	
7.	17AGX14	Building Materials and Farm Structures	PSE	-	3	3	0	0	3	
8.	17AGX17	Fundamentals and application of nanotechnology	PSE	-	3	3	0	0	3	
9.	17AGX20	Organic Farming	PSE	-	3	3	0	0	3	
10.	17CSX31	Problem Solving and Programming	OE	-	3	3	0	0	3	
11.	17ITX26	Problem Solving and Algorithmic Skills	OE	-	3	3	0	0	3	
(b) Open Electives			AICTE Credit Distribution Norm:18							
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	17AGZ01	Baking and Confectionery Technology	OE	-	3	3	0	0	3	VII
2.	17AGZ02	Food safety and quality control system	OE	-	3	3	0	0	3	VII
3.	17AGZ03	Farm Mechanization	OE	-	3	3	0	0	3	VIII
4.	17AGZ04	Processing of Fruits and Vegetables	OE	-	3	3	0	0	3	VIII
5.	17CHZ01	Waste Water Treatment	OE	-	3	3	0	0	3	VII
6.	17CHZ02	Piping Engineering	OE	-	3	3	0	0	3	VII
7.	17CHZ03	Process Automation	OE	-	3	3	0	0	3	VII
8.	17CHZ04	Process Instrumentation	OE	-	3	3	0	0	3	VII
9.	17CEZ01	Energy conservation in buildings	OE	-	3	3	0	0	3	VII
10.	17CEZ02	Air Pollution Management	OE	-	3	3	0	0	3	VIII
11.	17CEZ03	Building Services	OE	-	3	3	0	0	3	VIII
12.	17CEZ04	Road Safety Management	OE	-	3	3	0	0	3	VII
13.	17CEZ05	Waste Management	OE	-	3	3	0	0	3	VII/VIII
14.	17CSZ01	Design Thinking	OE	-	3	3	0	0	3	VII
15.	17CSZ02	Digital Marketing	OE	-	3	3	0	0	3	VII
16.	17CSZ03	Software Engineering	OE	-	3	3	0	0	3	VIII
17.	17CSZ04	Unified Functional Testing	OE	-	3	3	0	0	3	VIII
18.	17CSZ05	C Programming	OE	-	3	3	0	0	3	VI
19.	17CSZ06	Data Structures	OE	-	3	3	0	0	3	VI
20.	17CSZ07	Web Services using Java	OE	-	3	3	0	0	3	VI
21.	17ECZ01	Modern wireless	OE	-	3	3	0	0	3	VII

		communication system								
22.	17ECZ02	Consumer Electronics	OE	-	3	3	0	0	3	VII
23.	17ECZ03	Automotive Electronics	OE	-	3	3	0	0	3	VIII
24.	17ECZ04	Electronic Testing	OE	-	3	3	0	0	3	VIII
25.	17EEZ01	Renewable Energy Technology	OE	-	3	3	0	0	3	VII
26.	17EEZ02	Smart Grid	OE	-	3	3	0	0	3	VII
27.	17EEZ03	Energy Auditing, Conservation and Management	OE	-	3	3	0	0	3	VIII
28.	17EEZ04	Electrical Machines	OE	-	3	3	0	0	3	VIII
29.	17EIZ01	Autotronix	OE	-	3	3	0	0	3	VII
30.	17EIZ02	Industrial Automation	OE	-	3	3	0	0	3	VII
31.	17EIZ03	Fiber Optic Sensors	OE	-	3	3	0	0	3	VIII
32.	17EIZ04	Ultrasonic Instrumentation	OE	-	3	3	0	0	3	VIII
33.	17ITZ01	Software Testing Tool	OE	-	3	3	0	0	3	VII
34.	17ITZ02	User Experience	OE	-	3	3	0	0	3	VII
35.	17ITZ03	Developing Mobile Apps	OE	-	3	3	0	0	3	VIII
36.	17ITZ04	Software Project Management	OE	-	3	3	0	0	3	VIII
37.	17ITZ05	Java Programming	OE	-	3	3	0	0	3	VII
38.	17MEZ01	Engineering Ergonomics	OE	-	3	3	0	0	3	VII / VIII
39.	17MEZ02	Energy Audit and Resource Management	OE	-	3	3	0	0	3	VII / VIII
40.	17MEZ03	Electric Vehicle Technology	OE	-	3	3	0	0	3	VII / VIII
41.	17MEZ04	Value Engineering	OE	-	3	3	0	0	3	VII / VIII
42.	17MEZ05	Smart Mobility	OE	-	3	3	0	0	3	VII / VIII
43.	17MEZ06	Smart Sensor Systems	OE	-	3	3	0	0	3	VII / VIII
44.	17MYZ01	Mathematical Structures	OE	-	3	3	0	0	3	VII
45.	17MYZ02	Optimization Techniques	OE	-	3	3	0	0	3	VII
46.	17MYZ03	Statics for Engineers	OE	-	3	3	0	0	3	VII
47.	17MYZ04	Statistics for Engineers	OE	-	3	3	0	0	3	VII
48.	17PYZ01	Nanomaterials	OE	-	3	3	0	0	3	VII
49.	17PYZ02	Nuclear physics and Reactors	OE	-	3	3	0	0	3	VII
50.	17PYZ03	Space science and technology	OE	-	3	3	0	0	3	VII
51.	17CYZ01	Chemistry for Every Day Life	OE	-	3	3	0	0	3	VII
52.	17CYZ02	E - Waste Management	OE	-	3	3	0	0	3	VII
53.	17CYZ03	Industrial Chemistry	OE	-	3	3	0	0	3	VII
54.	17EYZ01	Communicative Hindi	OE	-	3	3	0	0	3	VII

55.	17EYZ02	Fundamentals of German	OE	-	3	3	0	0	3	VII
56.	17EYZ03	Basics of Japanese	OE	-	3	3	0	0	3	VII
57.	17EYZ04	Employability Enhancement and Analytical Skills	OE	-	3	3	0	0	3	VII
58.	17EYZ05	Workplace Communication	OE	-	3	3	0	0	3	VII
59.	17GYZ01	Biology for Engineers	OE	-	3	3	0	0	3	VII
60.	17BMZ01	Health care technology	OE	-	3	3	0	0	3	VII
61.	17BMZ02	Telemedicine	OE	-	3	3	0	0	3	VII
62.	17BMZ03	Epidemiology and Pandemic Management	OE	-	3	3	0	0	3	VII
63.	17BMZ04	Medical Ethics	OE	-	3	3	0	0	3	VII
64.	17EYX01	Effective Communication	OE	-	3	3	0	0	3	VII
65.	17AIZ01	Fundamentals of artificial intelligence and machine learning	OE	-	3	3	0	0	3	VII
66.	17AIZ02	Data science fundamentals	OE	-	3	3	0	0	3	VII
67.	17AIZ03	Introduction to Business analytics	OE	-	3	3	0	0	3	VIII
68.	17AIZ04	Augmented reality/virtual reality technologies	OE	-	3	3	0	0	3	VII
69.	17ITZ06	Data structures using C	OE	-	3	3	0	0	3	VII
70.	17ITZ07	Product Lifecycle Management for Engineers	OE		3	3	0	0	3	VII

(D) Employability Enhancement Courses

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	17GED06	Comprehension	EEC	-	2	0	0	2	0	VI
2.	17AGD01	Project Work-I	EEC	-	8	0	0	8	4	VII
3.	17AGP12	Industrial Training (4 weeks)	EEC	-	-	0	0	0	1	VII
4.	17AGD02	Project Work-II	EEC	17AGD01	16	0	0	16	8	VIII

Honor Degree Courses										
Vertical I - Water Management and Protected Cultivation										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	17AGX08	Watershed Management	PSE	-	3	3	0	0	3	VI
2.	17AGX12	Soil and Water Conservation Engineering	PSE	-	3	3	0	0	3	VI
3.	17AGX09	On Farm Water Management	PSE	-	3	3	0	0	3	VI
4.	17AGX21	Irrigation water quality and waste water management	PSE	-	3	3	0	0	3	VI
5.	17AGX07	Seed Technology Applications	PSE	-	3	3	0	0	3	VI
6.	17AGX04	Climate Change and Adaptation	PSE	-	3	3	0	0	3	VII
7.	17AGX22	Landscape architecture	PSE	-	3	3	0	0	3	VII
8.	17AGX19	Design and maintenance of greenhouse	PSE	-	3	3	0	0	3	VII

Vertical II - Agricultural Management and IoT in Agri										
S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PREREQUISITE	CONTACT PERIODS	L	T	P	C	P.S
1.	17AGX02	Agricultural Business Management	PSE	-	3	3	0	0	3	VI
2.	17AGX15	Extension methods and transfer of technology	PSE	-	3	3	0	0	3	VII
3.	17AGX23	Integrated farming system	PSE	-	3	3	0	0	3	VII
4.	17AGX16	Food plant design, food safety and management	PSE	-	3	3	0	0	3	VII
5.	17ECX16	Internet of Things and Its Applications	PSE	-	3	3	0	0	3	VII
6.	17AGX24	IT in agricultural system	PSE	-	3	3	0	0	3	VII

7.	17AGX03	Systems Analysis and Soft Computing in Agricultural Engineering	PSE	-	3	3	0	0	3	VII
8.	17AGX18	Human Engineering and Safety in Agriculture	PSE	-	3	3	0	0	3	VII

SUMMARY										
S. No.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1.	HS	3	3	0	0	0	0	0	0	6
2.	BS	12	7	3	3	0	0	0	0	25
3.	ES	8	9	8	3	0	0	0	0	28
4.	PC	0	5	12	16	16	13	13	0	75
5.	PSE	0	0	0	0	6	9	3	3	21
6.	OE	0	0	0	0	0	0	3	3	6
7.	EEC	0	0	0	0	0	0	5	8	13
CREDITS TOTAL		23	24	23	22	22	22	24	14	174

17EYA01– PROFESSIONAL ENGLISH – I (Common to All Branches)					
		L	T	P	C
		2	0	2	3
PREREQUISITE: NIL		QUESTION PATTERN: TYPE – 1			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes : The students will be able to		
1.0	To articulate and enunciate words and sentences clearly and efficiently using grammatical structures.	1.1	Construct clear, grammatically correct sentences using a variety of sentence structures and appropriate vocabulary.		
2.0	To acquire information through listening and apply it to persuade or articulate one’s own point of view.	2.1	Utilize listening skills to articulate one’s own point of view in different circumstances.		
3.0	To enable students to express themselves fluently and appropriately in social and professional contexts.	3.1	Apply appropriate communication skills across settings, purposes, and audiences.		
4.0	To summarize and paraphrase information in a text through reading skills.	4.1	Distinguish main ideas and supporting details and employ active reading strategies to understand texts at the maximum level.		
5.0	To understand different techniques and contents based on the written communication.	5.1	Equip themselves with writing skills needed for academic as well as workplace contexts.		

UNIT I - FOCUS ON LANGUAGE	(6+6)
Parts of Speech – Articles - Primary Auxiliaries – Modal Auxiliaries - Questions (‘Yes/No’ & ‘Wh’ Type) – Negatives - Prepositions – Conjunctions - Tenses (Simple, Continuous, Perfect, Perfect Continuous) - Vocabulary (Synonyms & Antonyms) - Homophones – Homonyms - One Word Substitution	
UNIT II – LISTENING FOR EFFECTIVENESS	(6+6)
Listening to Short Conversations or Monologues - Listening to Verbal and Non-Verbal Communication – Listening to Announcements - Listening and Note-taking – Listening to Telephonic Conversations – Listening to TED/ Ink talks- Intensive listening to fill in the gapped text	
UNIT III – COMMUNICATION BOOSTERS	(6+6)
Introducing Oneself – Exchanging Personal information (Likes & Dislikes) – Talking about Family & Friends - Asking about Routine Actions and Expressing Opinions - Participating in Short Conversations - Situational Talk	
UNIT IV – PROFESSIONAL READING	(6+6)
Skimming – Scanning (Short Texts and Longer Passages) – Inferring Technical Texts – Reading for Interrogation – Reading Newspaper, Advertisements and Interpreting – Practicing Speed Reading - Reading Comprehension (Multiple choice / Short / Open ended Questions) - Gap Filling	
UNIT V – TECHNICAL CORRESPONDENCE	(6+6)
Seeking Permission for Industrial Visit & In-plant Training – Checklist – Instruction - E-mail Writing - Report Writing (Accident & Survey)	

LIST OF SKILLS ASSESSED IN THE LABORATORY

1. Language Skills.
2. Listening Skills.
3. Speaking Skills.
4. Reading Skills
5. Writing Skills

TOTAL (L:30, P:30) = 60 PERIODS**TEXT / REFERENCE BOOKS:**

1. Sudharshana, N.P and Saveetha.C. "English for Technical Communication". Cambridge University Press, New Delhi, 2016.
2. Jackman, Vanessa and Russell, Whitehead. "Cambridge English Business Preliminary Practice Tests". Oxford University Press, New Delhi, 2016.
3. Rizvi, Ashraf M. "Effective Technical Communication". Tata McGraw Hill Publishing Company Limited, New Delhi, 2006.
4. Hewings, M. "Advanced English Grammar". Cambridge University Press, Chennai, 2000.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3			3		
2				3						3	3	3		
3				3						3	3	3		
4				2						3	3	2		
5				3						2	2	3		
CO(W.A)				3					3	3	3	3		

17MYB01 - CALCULUS AND SOLID GEOMETRY (Common to all Branches)					
		L	T	P	C
		3	2	0	4
PREREQUISITE: NIL		QUESTION PATTERN: TYPE – 4			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes The students will be able to			
1.0	To develop the use of matrix algebra techniques those are needed by engineers for practical applications.	1.1	Apply the concept of orthogonal reduction to diagonalize the given matrix.		
2.0	To see the techniques, Skills and Engineering tools necessary for engineering practice, with Geometric concepts.	2.1	Have knowledge about the geometrical aspects of sphere.		
3.0	To improve their ability in solving geometrical applications of differential calculus problems.	3.1	Find the radius of curvature, circle of curvature and centre of curvature for a given curve.		
4.0	To learn the important role of Mathematical concepts in engineering applications with the functions of several variables.	4.1	Classify the maxima and minima for a given function with several variables, through by finding stationary points.		
5.0	To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.	5.1	Demonstrate the use of double and triple integrals to compute area and volume.		

UNIT I – MATRICES	(9+6)
Characteristic Equation-Eigen values and Eigen vectors of a matrix –Properties (statement only)-Cayley Hamilton Theorem and its applications- Orthogonal transformation of a symmetric matrix to a diagonal form - Quadratic form-Reduction of a Quadratic form to canonical form by orthogonal transformation.	
UNIT II - ANALYTICAL GEOMETRY OF THREE DIMENSIONS	(9+6)
Equation of a Plane –Angle between two planes - Equation of straight lines-Coplanar lines- skew lines- Equation of a sphere – Orthogonal spheres.	
UNIT III - GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	(9+6)
Curvature – Curvature in Cartesian co-ordinates-Centre and Radius of curvature-Circle of curvature-Evolutes and Involutives-Envelopes.	
UNIT IV - FUNCTIONS OF SEVERAL VARIABLES	(9+6)
Partial derivatives - Euler’s theorem on homogeneous function-Jacobian-Maxima and Minima of functions of two variables-Constrained Maxima and Minima by Lagrange’s multiplier method.	
UNIT V - MULTIPLE INTEGRALS	(9+6)
Double integration in Cartesian Co-ordinates-Change of order of integration-Area as double integral-Triple integration in Cartesian Co-ordinates-Volume as triple integrals.	
TOTAL (L: 45+T:30) = 75 PERIODS	

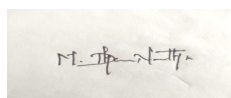
Note : Simulation of Engineering Problems (Qualitative Analysis) using open source software**TEXT BOOKS:**

1. Dr.B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna publications, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & sons, 2013.
3. Veerarajan.T, "Engineering Mathematics for Semester I & II ", Third Edition, Tata McGraw Hill,2014.

REFERENCES:

1. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics: Sem-II", 5th Edition, Laxmi Publications.2011.
2. Kandasamy .P, Thilagavathy .K , Gunavathy .K , "Engineering Mathematics for first Year", 9th Rv. Ed., S.Chand & Co Ltd, 2013.
3. Glyn James, "Advanced Engineering Mathematics", 7thEdition, Wiley India, 2007.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	3		3		2		3		3	3	1	1
2	2	3	3		2	3			3		2		1	1
3	3	1	3						3		1		1	2
4	3	3	2	3							3		1	
5	2	3	3	3		3			3		3		1	
CO(W.A)	2	2	3	3	3	3	2		3		2	3	1	1



17PYB01- PHYSICS FOR ENGINEERS (Common to All Branches except CSE and IT)					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL		QUESTION PATTERN: TYPE – 1			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes :The students will be able to			
1.0	To provide the basic ideas in all the kinds of engineering branches	1.1	Acquire knowledge regarding Acoustics and ultrasonic		
2.0	To develop the skills of the students in physics under various applications	2.1	Apply knowledge in the fields of optics & laser technology		
3.0	To cultivate the sensor designing ability of the students	3.1	Design the sensors using the knowledge of fiber optics		
4.0	To provide knowledge in wave and particle physics	4.1	Gain the knowledge of wave, particle nature and matter waves		
5.0	To provide the fundamental knowledge in basics of crystals	5.1	Analyze the different kind of crystal structures and crystal growth		

UNIT I - ULTRASONIC'S & ACOUSTICS	(9)
<p>Ultrasonic's: Introduction - Properties of Ultrasonic- Magnetostriction and piezo electric methods. Measurement of velocity using acoustic grating- Ultrasonic A B C scan method - Sonogram.</p> <p>Acoustics: characteristics of musical sound – loudness – Weber – Fechner law – absorption coefficient – reverberation – reverberation time – Factors affecting acoustics of buildings and their remedies.</p>	
UNIT II – OPTICS & LASER TECHNOLOGY	(9)
<p>Interference: Air wedge – theory – uses – testing of flat surfaces – determination of thickness of a thin wire. Types of lasers – Nd – YAG laser – CO₂ laser – semiconductor laser (homojunction & heterojunction). Applications: Determination of particle size using laser - Holography – construction – reconstruction – Lasers in industry (Material Processing) and Medical field (Surgery)</p>	
UNIT III - FIBER OPTICS AND SENSORS	(9)
<p>Principle of light transmission through fiber - expression for acceptance angle and numerical aperture – Fabrication of optical fibers- Double crucible method - types of optical fibers (material, refractive Index profile and mode) fiber optic communication system. Splicing – Applications of optical fiber - Sensors- temperature- pressure sensor and displacement sensor Medical Endoscope.</p>	
UNIT IV – WAVE AND PARTICLE PHYSICS	(9)
<p>Development of quantum theory – de Broglie wavelength – properties of matter waves - G.P Thomson experiment - Schrödinger's wave equation – time dependent – time independent wave equations – physical significance – applications – particle in a one dimensional potential box - Compton Effect – theory and experimental verification.</p>	

UNIT V - CRYSTALLOGRAPHY	(9)
Lattice – unit cell – Bravais lattices – lattice planes – Miller indices – ‘d’ spacing in cubic lattice – calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC and HCP structures – Crystal growth techniques- solution, melt (Czochralski) and vapour growth techniques (qualitative).	
TOTAL(L:45) = 45 PERIODS	
TEXTBOOKS:	
<ol style="list-style-type: none"> 1. V. Rajendran, "Engineering Physics", Tata McGraw-Hill, New Delhi, 2011. 2. G Senthilkumar. "Engineering Physics" VRB Publishers, 2011 	
REFERENCES:	
<ol style="list-style-type: none"> 1. P. K. Palanisami, "Physics for Engineers" Vol. 1, SciTech Pub. (India) Pvt. Ltd., Chennai, 2002. 2. M. N. Avadhanulu and P. G. Kshirsagar, "A Textbook of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2005 3. R. K. Gaur and S. L. Gupta, "Engineering Physics", Dhanpat Rai Publishers, New Delhi, 2006. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3			3										2
2	2				3								1	2
3				2	2								1	
4		3		3									1	2
5	2							3					1	2
CO(W.A)	2	3		3	3			3					1	2

17CYB01 - APPLIED CHEMISTRY <i>(Common to MECH, CIVIL, AGRI & CHEMICAL ENGG. Branches)</i>				
			L	T
			P	C
			3	0
			0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – 3		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes The students will be able to		
1.0	To understand the principles of water characterization and treatment methods	1.1	Apply knowledge of fundamental principles of chemistry	
2.0	To introduce the basic concepts of electrode potential and batteries	2.1	Solve engineering problems, including the utilization of creative and innovative skills	
3.0	To understand the principles and applications of corrosion	3.1	Gain practical experience with chemical process equipment as well as to analyze and interpret data	
4.0	To gain knowledge on engineering materials and industrial importance of fuels and combustion	4.1	Understand the impact of engineering solutions in a global, economic, environmental, and societal content	
5.0	To understand the concept of various analytical techniques	5.1	Understand the concept of engineering materials	

UNIT I : WATER TECHNOLOGY	(9)
Hardness - types - estimation by EDTA method - Domestic water treatment - disinfection methods (chlorination, ozonation and UV treatment) - Boiler troubles (scale, sludge, priming, foaming and caustic embrittlement) -Internal conditioning(carbonate, phosphate and calgon) - External conditioning - demineralization process - desalination - reverse osmosis method.	
UNIT II : ELECTROCHEMISTRY	(9)
Electrochemistry - electrode potential - Nernst equation and problems - Reference electrode - standard hydrogen electrode - calomel electrode - potentiometric titration (redox) - conductometric titration (strong acid – strong base) - Batteries - types - lead acid battery – fuel cell – hydrogen and oxygen fuel cell.	
UNIT III : CORROSION SCIENCE	(9)
Corrosion - definition – types - chemical and electrochemical corrosion (mechanism) – Galvanic corrosion – Differential aeration corrosion - Pitting corrosion – Factors influencing corrosion- Corrosion control - sacrificial anode method.	
UNIT IV : FUELS AND COMBUSTION	(9)
Fuels -Solid fuels - coal - proximate analysis - metallurgical coke - manufacture by Otto-Hoffmann method - Liquid fuels - synthetic petrol - Fischer Tropsch and Bergius processes - knocking - octane number - cetane number - -Gaseous fuels - water gas - producer gas - Combustion - flue gas analysis - Orsat apparatus.	

UNIT V : ANALYTICAL TECHNIQUES	(9)
Colorimetry - principles – estimation of Iron by colorimetry – UV–Visible spectroscopy – principles - instrumentation (block diagram only) - IR spectroscopy – principles - instrumentation (block diagram only) - Flame Photometry – principles - instrumentation (block diagram only) - estimation of sodium by flame photometry – Atomic absorption spectroscopy – principles - instrumentation (block diagram only) - estimation of nickel by atomic absorption spectroscopy.	
TOTAL (L:45)= 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. P.C. Jain.and Monica Jain, “Engineering Chemistry”,Vol I & II, Dhanpat Rai Pub,Co., 15th ed., New Delhi, 2013. 2. Dr.Ravikrishnan.A, “Engineering chemistry I & Engineering Chemistry II, SriKrishnaHitech Publishing chem Co. Pvt Ltd., 13th ed., Chennai, 2014. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. S.S. Dara, “A Text book of Engineering Chemistry”,S.Chand & Co. Ltd., New Delhi, 2014. 2. N. Krishna murthy, D. Vallinayagam, “Engineering chemistry” PHI Learning Pvt Ltd., 2014. 3. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Pub. Co. Ltd., New Delhi (2012). 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	3									3	2	3
2	3	3		3	3		3					2	2	3
3	2	2			2							3	3	2
4	3		3			2	3					3	3	2
5	3				3			2				2	1	
CO(W.A)	3	3	3	3	3	2	3	2				3	2	3

17EEC01 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING <i>(Common to AGRI. and CIVIL Branches)</i>				
	L	T	P	C
	3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – 3		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The students will be able to		
1.0	To impart knowledge on electric circuit laws, single phase circuits and measuring instruments.	1.1	Apply the basic laws and investigates the behavior of electric circuits by analytical instruments.	
2.0	To learn the basic principles of electrical machines and their performance.	2.1	Identify the electrical components and explore the characteristics of electrical machines.	
3.0	To expound the fundamentals of semiconductor and applications.	3.1	Analyze the various characteristics of semiconductor devices and applications.	
4.0	To introduce the fundamentals of digital circuits, combinational and sequential circuit.	4.1	Expose the concept of digital electronics	
5.0	To impart knowledge on communication systems.	5.1	Understand the fundamental of communication systems.	

UNIT I - ELECTRICAL CIRCUITS & MEASUREMENTS	(9)
Ohm's Law – Kirchhoff's Laws – Mesh and Nodal analysis– Introduction to AC circuits – Power and Power factor - Classification of instruments – Operating principles of moving coil, moving iron instruments and dynamometer type wattmeter - Induction type energy meter.	
UNIT II - ELECTRICAL MACHINES	(9)
DC Generator - DC Motor - Single phase transformer - Single phase induction motor: construction, principle of operation, basic equations and applications.	
UNIT III - SEMICONDUCTOR DEVICES AND APPLICATIONS	(9)
Introduction - Characteristics of PN junction diode and Zener diode – Half wave and Full wave rectifier – Bipolar junction transistor: CB, CE, CC configurations and characteristics.	
UNIT IV - DIGITAL ELECTRONICS	(9)
Binary number system - Logic gates – Boolean laws –Half and Full adders – Introduction to sequential circuits: Flip-Flops (RS, D, T and JK), shift registers and counters - ADC and DAC.	
UNIT V - FUNDAMENTALS OF COMMUNICATION ENGINEERING	(9)
Introduction - Elements of communication systems - Amplitude and Frequency modulation - Demodulation - Communication systems: Radio, TV, ISDN, Microwave, Satellite and Optical fibre. (Block Diagram Approach only)	
TOTAL (L: 45) = 45 PERIODS	

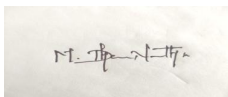
TEXT BOOKS:

1. D P Kothari and I.J Nagarath," Electrical Machines "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint ,2016.
2. R.Muthusubramaian, S.Salivahanan and K.A.Muraleedharan, "Basic Electrical, Electronics and Computer Engineering", 2nd ed., Tata MCGraw Hill. 2012.

REFERENCE BOOKS:

1. Sedha R.S., "Applied Electronics", S. Chand & Co., 2008.
2. Mittle and V. N. Mittle, "Basic Electrical Engineering", Tata McGraw Hill Edition, New Delhi, 2005.
3. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson India, 2011.
4. Nageswara Rao.T, "Circuit Theory", A.R. Publications, Chennai, 2014.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3		3		3						3	2	2
2	3	2		3		3						2	2	2
3	2	2	2		2	3						3	3	1
4	3		2		2	3						3	3	
5	3		2		3	2						2	1	
CO (W.A)	3	2	2	3	2	3						3	2	2

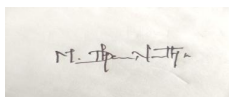


17CSC01 – PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to CIVIL, MECH., AGRI. & CHEMICAL Branches)					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE - 1			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes The students will be able to		
1.0	To gain knowledge about the basics of computer	1.1	Identify the appropriate problem solving techniques to drive the solution for the given problem.		
2.0	To educate about problem solving strategies	2.1	Solve problems using various strategies		
3.0	To impart the fundamental concepts of Python Programming	3.1	Develop programs on Python Programming constructs		
4.0	To gain exposure about string manipulation, list, and tuples	4.1	Realize the need of strings, list, and tuples		
5.0	To get knowledge about dictionaries, function and modules	5.1	Design programs involving dictionaries and function		

UNIT I BASICS OF COMPUTERS	(9)
Computer Basics - Applications and characteristics of Computer – Generations of Computers - Computer organization - Computer Software -Types of software - Software Development steps – Basic Internet Terminologies.	
UNIT II PROBLEM SOLVING STRATEGIES	(9)
Number System and Arithmetic - Algorithms, building blocks of algorithms (instructions/statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), simple strategies for developing algorithms (iteration, recursion). – Programming Errors – Programming Paradigm.	
UNIT III INTRODUCTION TO PYTHON	(9)
History – Features – Execution of python program – Flavors of Python – Comments - Data Types - Built-in data types– Sequences - Literals– Operators – Input and Output Statements - Conditional Statements : if – if-else – Nested if-else – For – While – Nested loops – Break – Continue - pass - assert - return	
UNIT IV STRINGS, LISTS AND TUPLES	(9)
Strings and Characters: Creating – Length – Indexing – Slicing – Repeating – Concatenation – Comparing - Removing Spaces - Finding Sub Strings - Counting Substrings in a String - Strings are Immutable - Replacing a String with another String - Splitting and Joining Strings - Changing Case of a String - Checking Starting and Ending of a String - Formatting the Strings - Working with Characters - Sorting Strings - Searching - Finding Number. Lists: Creating Lists – Updating - Concatenation - Repetition - Methods – Sorting. Tuples: Creating - Accessing – Operations – Functions - Nested Tuples - Inserting Elements, Modifying Elements, Deleting Elements from a Tuples.	

UNIT V DICTIONARIES AND FUNCTIONS	(9)
<p>Dictionaries: Operations – Methods - Using for Loop with Dictionaries – Sorting the Elements of a Dictionary using Lambdas - Converting Lists and Strings into Dictionary - Passing Dictionaries to Functions - Ordered Dictionaries.</p> <p>Functions: Defining – Calling – Returning - Pass by Object Reference – Formal, Actual, Positional, Keyword, Default & Variable Length Arguments - Local and Global Variables - Recursive Functions - Lambdas - Function Decorators.</p>	
TOTAL (L: 45) = 45 PERIODS	
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Ashok.N.Kamthane, “Computer Programming”, 2nd ed., Pearson Education (India), 2012. 2. Dr. R. Nageswara Rao, “Core Python Programming”, Dreamtech Press, ed., 2017 <p>REFERENCES:</p> <ol style="list-style-type: none"> 1. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, Cengage Learning, 2012. 2. Wesley J. Chun, “Core Python Programming”, Pearson Education, 2nd ed., 2010. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3							3	3		1	
2	3		2							3				
3	3	3	2							3	2		1	1
4	2	3	2								3			
5	3	2	3								3			
CO(W.A)	3	3	2							3	3		1	1



17GYP01 - PHYSICS AND CHEMISTRY LABORATORY (Common to All Branches Except CSE & IT)					
		L	T	P	C
		0	0	4	2
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The students will be able to		
1.0	To provide the basic practical exposure to all the engineering and technological streams in the field of physics.	1.1	Acquire the fundamental knowledge in optics such as interference, Diffraction and Understand about the spectral instruments etc		
2.0	To provide the basic practical exposure to all the engineering and technological streams in the field of chemistry	2.1	Gain the basic knowledge about handling the laser light and Identify the basic parameters of an optical fibre		
3.0	To know about the water containing impurities and some physical parameters	3.1	Analyze the properties of matter with sound waves		
4.0	To gain the knowledge about light, sound, laser, fiber optics and magnetism	4.1	Apply knowledge of measurement of hardness producing ions, chloride, alkalinity, DO, conductance, EMF and pH		
5.0	To develop the knowledge of conductometric titration and viscometry	5.1	Understand the impact of water quality and solve engineering problems		

LIST OF EXPERIMENTS

PHYSICS LABORATORY- I (Any Five)

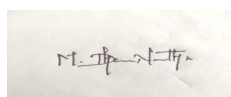
1. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
2. Determination of thickness of a thin wire – Air wedge method.
3. Determination of laser parameters - wavelength, particle size and angle of divergence of a Laser.
4. Determination of acceptance angle and numerical aperture of an optical fiber.
5. Determination of wavelength of mercury spectrum – spectrometer grating.
6. Determination of Young's modulus of the material – non uniform bending.
7. Determination of Band Gap of a semiconductor material.
8. Determination of viscosity of liquid – Poiseuille's method.
9. Solar cell – VI characteristics
10. V-I characteristics of PN junction diode.
11. Determination of thermal conductivity of a bad conductor – Lee's Disc method.

CHEMISTRY LABORATORY- I (Any Five)

1. Determination of total, temporary & permanent hardness of water by EDTA method.
2. Determination of alkalinity in water sample.
3. Determination of chloride content of water sample by argentometric method.
4. Conductometric titration of strong acid vs strong base.
5. Estimation of iron content of the given solution using potentiometer.
6. Determination of strength of given hydrochloric acid using pH meter
7. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
8. Estimation of iron content of the water sample using spectrophotometer

TOTAL(P:60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2		3			2					3	3	
2	3	3		3			2						3	1
3	3	3		3										1
4	3	3		3			3						1	2
5	2	2		3			3						2	2
CO(W.A)	3	3		3			3					3	2	2



17CSP01 – PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to Civil, Mech., Agri. & Chemical Branches)				
			L	T
			0	0
			P	C
			4	2
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The students will be able to		
1.0	To identify and understand word document and excel sheets.	1.1	Use MS Word and MS Excel for document preparation.	
2.0	To impart the fundamental concepts of Python Programming	2.1	Understand the basics of Python Programming constructs	
3.0	To gain exposure about string manipulation, list, and tuples	3.1	Realize the need of string manipulation, list, and tuples	
4.0	To get knowledge about dictionaries, function and modules	4.1	Design programs involving dictionaries, function and modules	
5.0	To learn about exception handling	5.1	Develop simple programs with exception handling	

Word Processing
<ol style="list-style-type: none"> 1. Document creation, Text manipulation with Scientific notations. 2. Table creation, Table formatting and 3. Mail merge and Letter preparation
Spread Sheet
<ol style="list-style-type: none"> 4. Chart - Line, XY, Bar and Pie. 5. Formula - formula editor
RAPTOR –Tool
<ol style="list-style-type: none"> 6. Drawing - flow Chart
Python-Programming
<ol style="list-style-type: none"> 7. Program Using Operators 8. Program Using Conditional Statements 9. Program Using Looping 10. Program Using Strings 11. Program Using Lists 12. Program Using Dictionaries 13. Program Using Functions

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS

Hardware

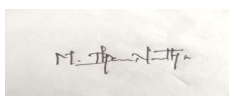
- LAN System with 33 nodes (OR) Standalone PCs – 33 Nos, Printers – 3 Nos.

Software

- OS – Windows / UNIX Clone
- Application Package – Office suite
- RAPTOR –Tool

TOTAL (P:60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3							3			1	1
2	3	3									3		1	
3	3	3	2						3		2			1
4	2	3	3						3		3		1	
5	3	3			3				3				1	1
CO(W.A)	3	3	3		3				3	3	3		1	1

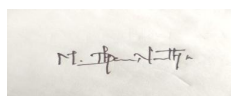


17GEP01 - PERSONAL VALUES (Common to All Branches)					
		L	T	P	C
		0	0	2	0
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The students will be able to			
1.0	To make students to learn individual in knowing them self	1.1	Become an individual in knowing the self		
2.0	To enable the student to understand Gratitude, Truthfulness, Punctuality, Cleanliness & fitness.	2.1	Acquire and express Gratitude, Truthfulness, Punctuality, Cleanliness & fitness.		
3.0	To enable the student to understand physical exercise and breathing techniques	3.1	Practice simple physical exercise and breathing techniques		
4.0	To make the students to Yoga asana which will enhance the quality of life.	4.1	Practice Yoga asana which will enhance the quality of life.		
5.0	To motivate the students to Practice Meditation and get benefited	5.1	Practice Meditation and get benefited.		

Values through Practical activities:
<p>1. Knowing the self Introduction to value education - Need & importance of Value education – Knowing the self – realization of human life – animal instinct vs sixth sense.</p> <p>2. Mental Health Evolution of senses – functioning steps of human mind – Body and Mind coordination - Analysis of thoughts – moralization of desires– autosuggestions – power of positive affirmations. – Meditation and its benefits.</p> <p>3. Physical Health Physical body constitution– Types of food - effects of food on body and mind – healthy eating habits – food as medicine– self healing techniques.</p> <p>4. Core value Self love & Self care: Gratitude - Happiness - Optimistic –Enthusiasm – Simplicity – Punctual - Self Control - Cleanliness & personal hygiene - Freedom from belief systems.</p> <p>5. Fitness Simplified physical exercises – Sun salutation - Lung strengthening practices: Naadi suddhi pranayama – Silent sitting and listening to nature – Meditation.</p>
TOTAL(P:30): 30 PERIODS
<p>REFERENCES:</p> <ol style="list-style-type: none"> 1. Know Yourself — Socrates – pdf format at www.au.af.mil/au/awc/awcgate/army/rotc_self-aware.pdf. 2. Steps to Knowledge: the book of Inner Knowing – pdf format at www.newmessage.org/wp-content/uploads/pdfs/books/stk_nkl_v1.5.pdf. 3. Promoting Mental Health - World Health Organization – pdf. 4. www.who.int/mental_health/evidence/mh_promotion_book.pdf

5. Learning to be: A Holistic and Integrated Approach to Values – UNESCO pdf format at [www.unesdoc.unesco.org/ images/ 0012/001279/127914e.pdf](http://www.unesdoc.unesco.org/images/0012/001279/127914e.pdf)
6. Personality Development by Swami Vivekananda -www.estudentedavedanta.net/personality-development.pdf

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3					3								
2	3						3							
3	3		3											
4	3		3			3								
5	3					3								
CO(W.A)	3		3			3	3							



17EYA02 – PROFESSIONAL ENGLISH – II (Common to All Branches)					
		L	T	P	C
		2	0	2	3
PREREQUISITE : 17EYA01			QUESTION PATTERN : TYPE – 1		
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The students will be able to		
1.0	To enable students to get familiar with words, phrases and sentences relevant to the immediate communication tasks.	1.1	Communicate using a variety of sentence structures and appropriate vocabulary.		
2.0	To help students to develop their listening skills and comprehend them by asking questions.	2.1	Comprehend conversations and short talks delivered in English and respond accordingly.		
3.0	To enhance students' speaking skills by making them to participate in Technical Presentation, Group Discussion, etc.	3.1	Speak appropriately and effectively in various situations.		
4.0	To inculcate reading habit and to develop effective reading skills.	4.1	Employ active reading strategies to understand texts at the maximum level.		
5.0	To foster the ability to write convincing Job Application and effective Formal Letters.	5.1	Equip themselves with writing formal letters and winning Job Application.		

UNIT I - LANGUAGE DEVELOPMENT	(6+6)
Vocabulary (Prefixes & Suffixes) - Active Voice and Passive Voice - Impersonal Passive Voice – Conditional Clauses – Subject - Verb Agreement - Direct and Indirect Speech - Idioms and Phrases - Discourse Markers - Error Spotting	
UNIT II – LISTENING COMPREHENSION	(6+6)
Listening for Specific Information and Match / Choose / Fill in the texts - Short Films, News, Biographies, Roles and Responsibilities in Corporate, Funny Shows – Listening to Iconic Speeches and making notes – Listening to Interviews	
UNIT III – ACQUISITION OF ORAL SKILLS	(6+6)
Describing a Person - Making Plans – Asking for and Giving Directions - Talking about Places - Talking over Phone – Narrating Incidents – Introduction to Technical Presentation - Story Telling – Group Discussion	
UNIT IV – READING NUANCES	(6+6)
Intensive Reading – Extensive Reading – Finding key information in a given text - Reading and Understanding Technical Articles - Reading and Interpreting Visual Materials	

UNIT V – EXTENDED WRITING	(6+6)
Job Application with Resume – Recommendation – Inviting Dignitaries - Accepting & Declining Invitation - Paragraph Writing (Topics and Images)	
LIST OF SKILLS ASSESSED IN THE LABORATORY	
1. Language Skills. 2. Listening Skills. 3. Speaking Skills. 4. Reading Skills. 5. Writing Skills	
TOTAL (L:30, P:30) = 60 PERIODS	
TEXT / REFERENCE BOOKS:	
1. Kumar, Suresh. E. "Engineering English". Orient Blackswan : Hyderabad, 2015. 2. Raman, Meenakshi and Sangeetha Sharma. "Technical Communication Principles and Practice". Oxford University Press: New Delhi, 2014. 3. Board of Editors. "Fluency in English – A Course Book for Engineering and Technology". Orient Blackswan: Hyderabad, 2016. 4. Comfort, Jeremy, et al. "Speaking Effectively: Developing Speaking Skills for Business English". Cambridge University Press: Cambridge, 2011.	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									1			1		
2				1						3	1	3		
3				1						3	1	3		
4				1						3	1	3		
5				1						3	1	3		
CO(W.A)				1					1	3	1	3		

17MYB02 COMPLEX ANALYSIS AND LAPLACE TRANSFORMS (Common to All Branches)					
		L	T	P	C
		3	2	0	4
PREREQUISITE : 17MYB01			QUESTION PATTERN : TYPE – 4		
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The students will be able to		
1.0	To expose the concepts of differential equations.	1.1	Predict the suitable method to solve second and higher order differential equations		
2.0	To communicate the problem solutions using correct Mathematical terminology of vector calculus.	2.1	Apply the concepts of Differentiation and Integration to Vectors.		
3.0	To apply rigorous and analytic approach to analyse the conformal mapping.	3.1	Compute an analytic function, when its real or imaginary part is known.		
4.0	To acquiring the knowledge of evaluating contour integrals using residue theorem.	4.1	Identify the Singularities and its corresponding Residues for the given function.		
5.0	To Apply the concepts of Laplace transforms & its applications to various problems related to Engineering.	5.1	Predict a suitable method to evaluate the Contour integration.		

UNIT I - ORDINARY DIFFERENTIAL EQUATIONS	(9+6)
Higher order linear differential equations with constant coefficients - Method of variation of parameters Cauchy's and Legendre's Equations.	
UNIT II - VECTOR CALCULUS	(9+6)
Gradient and Directional derivative -Divergence and Curl – Irrotational,solenoidal and scalar potential –Line integral over a plane curve-Surface Integral and Volume Integral-Green's theorem in a plane-Gauss divergence theorem and Stokes Theorem (Excluding Proofs)-Simple Applications Involving Square, Rectangles, Cube and Parallelopiped.	
UNIT III- ANALYTIC FUNCTIONS	(9+6)
Functions of a complex variable-Analytic functions– Necessary and sufficient conditions of Cauchy's -Riemann Equations in Cartesian Coordinates (Excluding Proofs) – Properties of Analytic Functions – Harmonic conjugate – Construction of an analytic function by Milne's Thomson Method– Conformal mapping : $w = cz + c$, $1/z$ and Bilinear Transformation.	
UNIT IV - COMPLEX INTEGRATION	(9+6)
Statement and Simple applications of Cauchy's integral theorem and Cauchy's integral formula(Excluding Proofs) – Taylor's and Laurent's Series Expansions - Singularities - Residues – Cauchy's Residue theorem (Statement only) – Evaluation of contour integration over unit circle and semi circle (Excluding poles on Real axis)	
UNIT V- LAPLACE TRANSFORM	(9+6)
Condition for existence - Transforms of Elementary functions –Basic Properties- First & Second Shifting Theorems (Statement only) –Transforms of derivatives and integrals- Transform of periodic functions - Initial and Final value Theorems. Inverse Laplace transforms -Convolution theorem (Statement only) –Solution of linear second order Ordinary differential equations with constant coefficients using Laplace transforms	
TOTAL (L: 45+T:30) = 75 PERIODS	

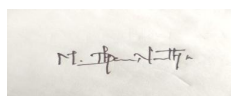
Note : Simulation of Engineering Problems (Qualitative Analysis) using open source software**TEXT BOOKS:**

1. Dr.B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition, Khanna publications, 2012.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & sons, 2013.
3. Veerarajan.T, "Engineering Mathematics for Semester I & II", Third Edition, Tata McGraw Hill,2014.

REFERENCES:

1. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics: Sem-II", 5th Edition,Laxmi Publications.2011.
2. Kandasamy .P, Thilagavathy .K, Gunavathy. K, "Engineering Mathematics for first Year", 9th Rv. Ed. S.Chand & Co Ltd, 2013.
3. Glyn James, "Advanced Engineering Mathematics", 7thEdition, Wiley India, (2007).

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	1		2	1	3					2	2	2	1
2	1	1			2	1						2		1
3	1	1		2				2					2	
4	1	1			3	2				1			2	
5	1		2				1					2	2	
CO(W.A)	1	1	2	2	2	2	1	2		1	2	2	2	1



17CYB03 ENVIRONMENTAL SCIENCE (Common to All Branches)				
			L	T
			3	0
PREREQUISITE : NIL		QUESTION PATTERN : TYPE – 3		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The students will be able to		
1.0	To understand the constitutes of the environment	1.1	Design a system, component, or process to meet desired needs.	
2.0	The students should be conversant with valuable resources	2.1	Identify, formulate, and solve environmental engineering problems	
3.0	To know about the role of a human being in maintaining a clean environment.	3.1	Understand the professional and ethical responsibility as related to the practice of environmental engineering and the impact of engineering solutions in a global context.	
4.0	To maintain ecological balance and preserve bio-diversity.	4.1	Use the techniques, skills, and modern engineering tools necessary for environmental engineering practice.	
5.0	To get knowledge about the conservation of environment for the future generation.	5.1	Acquire the knowledge of information technology in environmental science.	

UNIT I : INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES	(9)
Environment: Scope – importance - need for public awareness - Forest resources - Use-over exploitation-deforestation - Water resources - use-over utilization of surface and ground water - conflicts over water - Mineral resources - use-exploitation-environmental effects of extracting and using mineral resources - Food resources - world food problems changes caused by agriculture - Effects of modern agriculture - fertilizer- pesticide problems - Energy resources - Renewable energy sources - solar energy - wind energy. Land resources - land degradation - soil erosion - Role of an individual in conservation of natural resources.	
UNIT- II ECOSYSTEMS AND BIODIVERSITY	(9)
Concepts of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Food chains- food webs - types of ecosystem - structure and functions of forest ecosystem and river ecosystem – Biodiversity - value of biodiversity - consumptive use-productive use - social values - ethical values - aesthetic values - Hotspots of biodiversity -Threats to biodiversity - Habitat loss - poaching of wildlife and man wildlife conflicts- Conservation of biodiversity - In-situ and Ex-situ conservation of biodiversity.	
UNIT III : ENVIRONMENTAL POLLUTION	(9)
Pollution: Causes - effects and control measures of Air pollution - Water pollution - Soil pollution and Noise pollution - Solid waste management - Causes - effects -control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Disaster managements - Floods - cyclone- landslides.	

UNIT IV : SOCIAL ISSUES AND THE ENVIRONMENT	(9)
Water conservation - rain water harvesting - global warming - acid rain - ozone layer depletion - Environment protection act - Air (Prevention and control of pollution) Act - Water (prevention and control of pollution) Act - Green Chemistry – Principle of Green chemistry – Application of Green chemistry.	
UNIT V : HUMAN POPULATION AND THE ENVIRONMENT	(9)
Population growth - variation among nations - Population explosion - Family welfare programme - Human rights - HIV/AIDS – Human health and environment - women and child welfare - Role of information technology in environment and human health.	
TOTAL(L:45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Anubha Kaushik and C.P. Kaushik, Environmental Science and Engineering, New Age International Publishers, New Delhi (2015) 2. Dr. A.Ravikrishan, Environmental Science and Engineering., Sri Krishna Hitech Publishing co. Pvt. Ltd., Chennai,12th Edition (2016) 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Masters, Gilbert M, “Introduction to Environmental Engineering and Science”, Second Edition, Pearson Education, New Delhi (2012). 2. Santosh Kumar Garg, Rajeshwari garg, smf Ranjni Garg “Ecological and Environmental Studies” Khanna Publishers, Nai Sarak, Delhi (2014). 3. Miller T.G. Jr., “Environmental Science”, Tenth Edition, Wadsworth Publishing Co. (2015). 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		3	2								3		3	3
2				3					3				3	2
3	3				3	3	2	3					3	2
4	3				2	2							3	
5	3		3				3		3			3	2	
CO(W.A)	3	3	3	3	3	3	3	3	3		3	3	3	2

17AGC01 PRINCIPLES AND PRACTICES OF CROP PRODUCTION					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN : TYPE –I			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The students will be able to		
1.0	To introduce agriculture and crop production.	1.1	Examine agricultural production practices		
2.0	To acquire knowledge on crop selection and establishment	2.1	Plan various field preparation techniques for crops		
3.0	To know crop protection techniques for better crop production	3.1	Classify various weeds, pest & diseases, nutrient management for crops		
4.0	To Acquire adequate knowledge on production practices of agricultural crops	4.1	Recommend various agricultural crop production practices		
5.0	To Acquire adequate knowledge on production practices of horticultural crops	5.1	Recommend various horticultural crop production practices		

UNIT I – AGRICULTURE AND CROP PRODUCTION	(9)
Introduction to agriculture and its crop production sub-sectors - field crop production and horticulture; Factors affecting crop growth and production: genetic (internal) and environmental (external) factors; Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices	
UNIT II – CROP SELECTION AND ESTABLISHMENT	(9)
Regional and seasonal selection of crops; Systems of crop production; Competition among crop plants; Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage; Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing.	
UNIT III – CROP MANAGEMENT	(9)
Crop water Management; Crop nutrition management - need for supplementation to soil Supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients including fertigation scheduling; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest	
UNIT IV – PRODUCTION PRACTICES OF AGRICULTURAL CROPS	(9)
Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereal crops, grain legumes, oil seed crops, sugarcane, and fiber crops, and special purpose crops such as those grown for green manure and fodder.	
UNIT V – PRODUCTION PRACTICES OF HORTICULTURAL CROPS	(9)
Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, Flower crops; Cultivation practices of representatives of each group; Special features of production of horticultural crops - green house cultivation.	
TOTAL (L: 45) = 45 PERIODS	

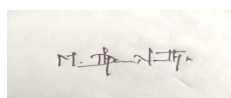
TEXT BOOKS:

1. Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.
2. Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 2005.

REFERENCES:

1. Bose T. K. and L.P.Yadav. Commercial Flowers, Naya Prakash, Calcutta.1989.
2. Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore. 2005
3. Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices, plantation crops, medicinal and aromatic plants. Rajalakshmi Publications, Nagercoil.1993.
4. Kumar, N., "Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 7th edition, 2015.
5. Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications, New Delhi. 1989.
6. Handbook of Agriculture. ICAR publications, New Delhi. 2016.

COURSE OUTCOME S	PROGRAMME OUTCOMES												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		2	3		3		3		2		1	2	3	
2			3		3		2				2	2	3	
3		3	3		3		1		1		2	2	3	
4		2	3		2			1			1	2	3	
5		2	3		2			1			1	2	3	
CO(W.A)		2	3		3		2	1	2		1	2	3	



17MEC01 – ENGINEERING GRAPHICS (Common to All Branches except CSE and IT)				
			L	T
			P	C
		2	2	0
PREREQUISITE : NIL		QUESTION PATTERN : TYPE - 2		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: : The students will be able to		
1.0	To gain knowledge about conic sections and plane curves	1.1	Construct conic sections and special curves of required specifications	
2.0	To learn the concept of first angle projection of points, lines and plane	2.1	Apply the concept of first angle projection to create project of straight lines, planes, solids and section of solids	
3.0	To understand and familiarize with the projection of solids	3.1	Develop a surface drawing of a solid model with given dimensions	
4.0	To learn the concept of sectioning of solids and developing the surfaces	4.1	Build orthographic, isometric projections of a three dimensional object	
5.0	To understand the orthographic, isometric and perspective projections of three dimensional objects	5.1	Make use of the knowledge of engineering drawing to create physical models	

CONCEPTS AND CONVENTIONS:	
Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning – Scales	
UNIT I - PLANE CURVES	(6+6)
Basic Geometrical constructions, Curves used in engineering practices - Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves - Theory of Projection - Principle of Multi-view Orthographic projection - Profile plane and Side views - Multiple views - Representation of Three Dimensional objects - Layout of views	
UNIT II - FIRST ANGLE PROJECTION OF POINTS, LINES AND PLANE	(6+6)
Principal planes - First angle projection - Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method - Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.	

UNIT III - PROJECTION OF SOLIDS	(6+6)
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method	
UNIT IV - SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES	(6+6)
Sectioning of solids (Prism, Cube, Pyramid, Cylinder and Cone) in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other - obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids - Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.	
UNIT V - ISOMETRIC, ORTHOGRAPHIC AND PERSPECTIVE PROJECTIONS	(6+6)
Principles of isometric projection - Isometric scale - Isometric projections of lines, plane figures, simple solids and truncated solids - Prisms, pyramids, cylinders, cones - combination of two solid objects in simple vertical positions - Free hand sketching of Orthographic views from Isometric views of objects. Perspective projection of simple solids - Cube, Prisms and pyramids by visual ray method	
TOTAL (L:30+T:30) = 60 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 2013. 2. N.S Parthasarathy and Vela Murali, "Engineering Drawing", Oxford University Press, 2015 	
REFERENCES:	
<ol style="list-style-type: none"> 1. N.D.Bhatt and V.M.Panchal, "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010. 2. K.R.Gopalakrishna., "Engineering Drawing" (Vol I&II combined) Subhas Stores, Bangalore, 2007 3. K. V.Natarajan, "A text book of Engineering Graphics", 28th Edition, Dhanalakshmi Publishers, Chennai, 2015. 4. Dr. M. Saravanan, Dr. M. Arockia Jaswin and J. Bensam Raj, "Engineering Graphics", Tri Sea Publications. 5. Luzzader, Warren.J., and Duff, John M, "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt Ltd, New Delhi, 2005 6. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson, 2nd Edition, 2009 	
INSTRUMENT : use of mini drafter is compulsory	
Special points applicable to End semester Examinations on Engineering Graphics:	
<ol style="list-style-type: none"> 1. The answer paper shall be of A3 size drawing sheets 2. Minimum one question and not more than two questions from a unit 3. Question paper consists of Part A and Part B 4. Part A: One compulsory question carries 20 marks from any one of five units 5. Part B: 4 out of 8 open choice questions carry 20 marks each 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2		3	2	2				3		2	3		3
2	2		2	1					3		3	2		2
3	3		3	3	3				3		2	2	3	3
4	3		3	3					2		3	3	2	
5	1		2	2					2		3	3	3	2
CO(W.A)	2		3	2	3				3		3	3	3	3

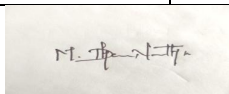
M. J. J. J. J.

17MEC02 – ENGINEERING MECHANICS (Common to Agri. and Mechanical Branches)				
		L	T	P
		3	2	0
PREREQUISITE : NIL		QUESTION PATTERN : TYPE - 1		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: : The students will be able to		
1.0	To acquire knowledge on the behaviour of a particle under the action of forces	1.1	Solve the engineering problems on stable particles using conditions for equilibrium	
2.0	To analyse the behaviour of the rigid body under the action of forces	2.1	Calculate the reaction forces of various supports and resultant forces on rigid bodies	
3.0	To gain knowledge related to friction and their types	3.1	Solve the problems involving dry friction under equilibrium conditions	
4.0	To introduce the geometric properties of the different surfaces and solids	4.1	Determine the centroid, centre of gravity and moment of inertia of various surfaces and solids.	
5.0	To teach energy and momentum methods related to Dynamics of particles	5.1	Solve the problems involving dynamics of particles and rigid bodies	

UNIT I - STATICS OF PARTICLE	(9+6)
Units and dimensions - fundamental principles - laws of mechanics, lame's theorem, parallelogram and triangular law of forces, principle of transmissibility - coplanar forces - resultant force - statics of particles in two dimension - equilibrium of particles in two dimension	
UNIT II - STATICS OF RIGID BODY	(9+6)
Equilibrium of rigid free body diagram - types of supports and their reactions - requirements of stable equilibrium - moments and couples - moment of a force about a point and about an axis - Varignon's theorem - equilibrium of rigid bodies in two dimensions	
UNIT III - FRICTION	(9+6)
Frictional force - Laws of Coulomb friction - angle of friction - cone of friction - simple contact friction - ladder friction - belt friction - transmission of power through belts - rolling resistance - problems involving the equilibrium of a rigid bodies with frictional forces	

UNIT IV - PROPERTIES OF SECTIONS	(9+6)
Centroid - first moment of area - Theorems of Pappus and Guldinus - second moment of area - moment and product of inertia of plane areas - transfer theorems - parallel axis theorem and perpendicular axis theorem - polar moment of inertia - principal axes and principal moment of inertia	
UNIT V - DYNAMICS OF PARTICLES	(9+6)
Displacements, velocity and acceleration, their relationship - absolute and relative motion method - linear motion - curvilinear motion - Newton's law - work energy equation of particles - impulse and momentum - impact of elastic bodies	
TOTAL (L:45 + T:30) = 75 PERIODS	
TEXTBOOKS:	
1. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)	
2. Ferdinand P. Beer and E. Russell Johnson, "Vector Mechanics for Engineers: Statics and Dynamics", 9 th ed., Tata McGraw Hill International Edition, 2010	
REFERENCES:	
1. Irving H. Shames, "Engineering Mechanics : Statics and Dynamics", Prentice Hall of India Private limited, 2003.	
2. Russell C Hibbeler, "Engineering Mechanics: Statics and Dynamics", 12 th ed., Prentice Hall, 2009.	
3. Anthony M. Bedford and Wallace Fowler, "Engineering Mechanics: Statics and Dynamics", 5 th ed., Prentice Hall, 2007.	
4. Palanichamy, M.S and Nagan,S, "Engineering Mechanics - Statics and Dynamics", 3 rd ed., Tata McGraw-Hill, New Delhi, 2005.	
5. Meriam.J.L and Kraige.L.G, "Engineering Mechanics: Statics and Dynamics", 6 th ed., Wiley Publishers, 2006.	
6. Rajasekaran.S and Sankarasubramanian.G, "Fundamentals of Engineering Mechanics", 3 rd ed., Vikas Publishing House Pvt. Ltd., New Delhi, 2005.	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3										3		3
2	2	3	2	1								3		3
3	3	3	2	2		1			2		3	3		3
4	3	3	2	2					2		3	3		3
5		3	2	2	2				2		2	3		3
CO(W.A)	3	3	2	2	2	1			2		3	3		3



17AGP01 CROP PRODUCTION AND HUSBANDRY LABORATORY				
		L	T	P
		0	0	4
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: : The students will be able to		
1.0	To acquire knowledge on field preparation, seed selection and seed treatment	1.1	Work on different agronomic practices	
2.0	To learn about nursery preparation	2.1	Prepare nursery for different crops	
3.0	To learn management of crops	3.1	Imply management concepts on crop	
4.0	To learn different harvest methods	4.1	Suggest suitable harvesting techniques	
5.0	To acquire knowledge on post harvest techniques like pre-cooling, transportation and storage	5.1	Minimize post harvest losses	

LIST OF EXPERIMENTS
<ol style="list-style-type: none"> 1. Field preparation studies 2. Seed selection and seed treatment procedures 3. Seed bed and Nursery preparation 4. Sowing / transplanting 5. Biometric observation for crops 6. Nutrient management Studies 7. Water management and irrigation scheduling 8. Weed management studies 9. Integrated pest management studies 10. Harvesting 11. Post harvesting 12. Study on meteorological instruments 13. Integrated farming system
TOTAL (P:60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1		2	3	3	2		2				1	2	1	
2	2		3		3		2				2	2	2	
3	2	3	3	2	3		1				2	2	3	
4	2	2	3	1	2						1	2	1	2
5	2	2	3	1	2						1	2		3
CO(W.A)	2	2	3	2	2		2				1	2	2	3

M. J. S. S. S.

17GYP02 – ENGINEERING PRACTICES LABORATORY (Common to All Branches)					
		L	T	P	C
		0	0	4	2
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: : The students will be able to		
1.0	To provide hands on training on various basic engineering practices in Civil Engineering	1.1	Understand various civil engineering practices like plumbing, carpentry and relevant tools		
2.0	To provide hands on training on various basic engineering practices in Mechanical Engineering	2.1	Understand various manufacturing processes like welding, machining and sheet metal work		
3.0	To understand the basic working principle of electric components	3.1	Make residential house wiring and Measure energy and resistance to earth of an electrical equipment		
4.0	To understand the basic working principle of electronic components	4.1	Perform the assembling and testing of the PCB based electronic circuits.		
5.0	To develop the skill to make / operate/utilize the simple engineering components	5.1	Make / operate / utilize the simple engineering components		

GROUP-A (MECHANICAL AND CIVIL ENGINEERING)	
I - CIVIL ENGINEERING PRACTICE	(15)
Buildings:	
a. Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects	
Plumbing Works:	
a. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings	
b. Study of pipe connections requirements for pumps and turbines	
c. Preparation of plumbing line sketches for water supply and sewage works	
d. Hands-on-exercise:	
Basic pipe connections - Mixed pipe material connection - Pipe connections with different joining components	
e. Demonstration of plumbing requirements of high-rise buildings	
Carpentry using Power Tools only:	
a. Study of the joints in roofs, doors, windows and furniture	
b. Hands-on-exercise: Planning, Tee joints	
II - MECHANICAL ENGINEERING PRACTICE	(15)
Welding:	
a. Preparation of edges for welding and study of welding symbols	
b. Arc welding- butt joints, lap joints and tee joints	
c. Gas welding	
d. Study of standard size of bars, rods, sections, sheet metals	
e. Study of work piece types and parameters of welding such as welding current, air gap, filler metal	
Basic Machining:	
a. Facing & Plain turning	

b. Drilling Practice	
c. Study of different types of screw drivers, screws, bolts and nuts	
Sheet Metal Work:	
a. Model making using bending and forming - Trays, cone	
b. Study of thickness gauges, wire gauges	
GROUP - B (ELECTRICAL AND ELECTRONICS)	
I - ELECTRICAL ENGINEERING PRACTICE	(15)
a. Residential house wiring using switches, fuse, indicator, lamp and energy meter	
b. Fluorescent lamp wiring	
c. Stair case wiring	
d. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit	
e. Measurement of energy using single phase energy meter	
f. Measurement of resistance to earth of electrical equipment.	
II - ELECTRONICS ENGINEERING PRACTICE	(15)
a. Study of Electronic components - Resistor (Colour coding), Inductor, Capacitor.	
b. Measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.	
c. Study of logic gates AND, OR, XOR and NOT.	
d. Study of Clock Signal.	
e. Soldering practice -Components Devices and Circuits - Using general purpose PCB.	
f. Study of Half Wave Rectifier (HWR) and Full Wave Rectifier (FWR).	
g. Study of Telephone, FM Radio and Cell Phone.	
TOTAL(P:60) = 60 PERIODS	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3			3		2			3		2	3	2	
2	3			2		3			3		3	2		1
3	2				3	3		2					1	2
4	3									2	3	3	2	3
5					3					3			2	
CO(W.A)	3			3	3	3		2	3	3	3	3	2	2

17GEP02 – INTER PERSONAL VALUES (Common to All Branches)					
		L	T	P	C
		0	0	2	0
PREREQUISITE : 17GEP01					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: : The students will be able to		
1.0	To know interpersonal values.	1.1	Develop a healthy relationship & harmony with others.		
2.0	To train the students to maneuver their temperaments.	2.1	Practice respecting every human being.		
3.0	To achieve the mentality of appreciating core values of a person.	3.1	Practice to eradicate negative temperaments.		
4.0	To analyze the roots of problems and develop a positive attitude about the life.	4.1	Acquire Respect, Honesty, Empathy, Forgiveness and Equality.		
5.0	To understand the effects of physical activities on mental health.	5.1	Practice Exercises and Meditation to lead a healthy life and Manage the cognitive abilities of an Individual.		

UNIT II – INTRODUCTION	(6)
Introduction to interpersonal values – Developing harmony with others –Healthy relationship – Need & importance of interpersonal values for dealing with others and team - Effective communication with others.	
UNIT II - MANEUVERING THE TEMPERAMENTS	(6)
From Greed To Contentment - Anger To Tolerance -Miserliness To Charity – Ego To Equality - Vengeance to Forgiveness.	
UNIT III - CORE VALUE	(6)
Truthfulness - Honesty –Helping–Friendship – Brotherhood – Tolerance –Caring & Sharing – Forgiveness – Charity –Sympathy — Generosity – Brotherhood -Adaptability.	
UNIT IV – PATHWAY TO BLISSFUL LIFE	(6)
Signs of anger – Root cause – Chain reaction – Evil effects on Body and Mind – Analyzing roots of worries – Techniques to eradicate worries.	
UNIT V - THERAPEUTIC MEASURES	(6)
Spine strengthening exercises - Nero muscular breathing exercises - Laughing therapy - Mindfulness meditation.	
TOTAL (P:30): 30 PERIODS	
REFERENCES:	
1. Interpersonal Skills Tutorial (Pdf Version) – Tutorials Point www.tutorialspoint.com/interpersonal_skills/interpersonal_skills_tutorial.pdf	
2. Interpersonal Relationships At Work - Ki Open Archive - Karolinska www.publications.ki.se/xmlui/bitstream/handle/10616/39545/thesis.pdf?sequence=1	
3. Values Education For Peace, Human Rights, Democracy – UNESCO. www.unesdoc.unesco.org/images/0011/001143/114357eo.pdf	
4. Maneuvering Of Six Temperaments - Vethathiri Maharishi. www.ijhssi.org/papers/v5(5)/F0505034036.pdf	
5. The Bliss Of Inner Fire: Heart Practice Of The Six. – Wisdom Publications - www.wisdompubs.org/sites/.../Bliss%20of%20Inner%20Fire%20Book%20Preview.pdf	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3					3								
2	3						3							
3	3		3											
4	3		3			3								
5	3					3								
CO(W.A)	3		3			3	3							

M. J. S. S. S.

17MYB03 FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATION (Common to Agriculture, Civil, Mechanical and Chemical Branches)					
		L	T	P	C
		2	2	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE - IV			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes : : The students will be able to		
1.0	To acquire knowledge to solve half range Fourier series and harmonic analysis.	1.1	Ability to have fundamental understanding of Fourier series and give Fourier expansions of a given function.		
2.0	To understand the concept of Fourier transforms and enhance the problem solving skill.	2.1	Apply transform techniques to solve engineering problems.		
3.0	To introduce how to solve linear partial differential equations with different methods.	3.1	Analyze and simulate the first and second order linear partial differential equations.		
4.0	To get the analytical solution for second and higher order homogeneous linear PDE's.	4.1	Demonstrate a firm understanding of the solution techniques for homogeneous linear PDE's.		
5.0	To solve different forms of wave and heat equations.	5.1	Ability to apply partial differential techniques to solve the physical engineering problems.		

UNIT - I FOURIER SERIES	(6+6)
Dirichlet's conditions - Fourier series: Half range sine series - Half range cosine series - Parseval's identity for half range series - Root -Mean square value of a function - Harmonic Analysis (π , degree and T- forms).	
UNIT - II FOURIER TRANSFORMS	(6+6)
Fourier integral theorem (statement only) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem.	
UNIT- III FIRST ORDER NON LINEAR PARTIAL DIFFERENTIAL EQUATIONS	(6+6)
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solution of standard types of first order partial differential equations: (i) $f(p,q)=0$, (ii) Clairaut's type, (iii) $f(z,p,q) = 0$, (iv) $f(x,p) = g(y,q)$.	
UNIT IV LINEAR PARTIAL DIFFERENTIAL EQUATIONS	(6+6)
General solution of Lagrange's linear equation $Pp+Qq = R$ - Solutions of simultaneous equations $dx/P=dy/Q =dz/R$ by the method of grouping & method of multipliers-Homogeneous linear partial differential equations of second and higher order with constant coefficients (R.H.S = 0, e^{ax+by} , $\cos(ax+by)$, $\sin(ax+by)$, $x^r y^s$).	

UNIT- V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	(6+6)
Classification of second order quasi linear partial differential equations - Solutions of one dimensional wave equation(zero and Non-zero Boundary conditions) - One dimensional heat equation(Reduced to zero & non zero temperature)- Steady state solution of two dimensional heat equation (Finite and infinite plate).	
TOTAL (L: 30+P:30) = 60 PERIODS	
TEXT BOOKS	
<ol style="list-style-type: none"> 1. Veerarajan,T. “ (Transforms and Partial Differential Equations)”, 2nd ed., Tata Mc Graw Hill, New Delhi, Second reprint, 2015. 2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., “Engineering Mathematics; Volume III”, S. Chand & Co Ltd., 2008. 	
REFERENCES	
<ol style="list-style-type: none"> 1. Goyal. Manish and Bali, N.P, “A Textbook of Engineering mathematics”, 6th ed., Laxmi Publication (P) Ltd. New Delhi, 2012. 2. Grewal, B.S. “Higher Engineering Mathematics”, 42nd ed., Khanna publishers, New Delhi, 2012. 3. Kreyszig, Erwin. “Advanced Engineering Mathematics”, 9th ed., Wiley Publications, New Delhi, 2006. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	1	3							2	3		2
2	2	3	3			3	3							3
3	3	3	2						3		3	1	3	3
4	3	3	2	3	3							3		3
5	3	2	3	2							1		3	2
CO(W.A)	3	3	2	3	3	3	3		3		2	2	3	3

17AGC02 SOIL SCIENCE AND ENGINEERING					
		L	T	P	C
		2	0	2	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – I			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: : The students will be able to			
1.0	To enhance the knowledge on rock cycle and soil formation process	1.1	Classify different soil and process of soil formation		
2.0	To gain knowledge on physical, chemical and biological properties of soil	2.1	Express the relationship of different phases of soil		
3.0	To know about the nutrient content, deficiency of soil	3.1	Impart knowledge of physical properties of soil		
4.0	To know about the major soil distribution	4.1	Suggest suitable crop		
5.0	To study the relationship between soil, water and plant	5.1	Suggest nutrient content and determine soil deficiency		

UNIT I – CLASSIFICATION AND FORMATION OF SOILS	(6)
Pedological and edaphological concepts- definition of soil, rocks and minerals-composition of earth- Weathering of rocks and minerals - physical, chemical and biological weathering - factors affecting soil formation processes	
UNIT II – PHASE RELATIONSHIP OF SOIL	(6)
Soil texture and textural classes - Soil structure and classification - absolute specific gravity - capillary and non-capillary porosity- Weight and Volume relationships- Gradation analysis- Soil consistency- classification of soil particles and their determination- Soil survey methods- Major soil types of India	
UNIT III – PHYSICAL PROPERTIES OF SOIL	(6)
Physical properties of soil and their significance - Bulk density, particle density and porosity - Soil colour - significance - causes and measurement- Soil temperature - Soil air - Soil water- Soil water potentials - Soil moisture constants - Movement of soil water - saturated and unsaturated flow - Infiltration, hydraulic conductivity, percolation, permeability and drainage	
UNIT IV – SOIL COLLOIDS	(6)
Soil colloids - Properties, types and significance - Layer silicate clays - their genesis and sources of charges - soil pH- Ion exchange - CEC, AEC and Base saturation - Factors influencing Ion exchange - significance. Soil reaction, Buffering capacity and EC	
UNIT V – SOIL FERTILITY	(6)
Soil organic matter – Composition – decomposition and mineralization, C : N ratio, Carbon cycle – Fractions of soil organic matter – Humus formation. Soil organisms – Beneficial and harmful effects- saline and alkali soils and their reclamations- significance of macro and micro nutrients, soil and water testing, soil fertility management- important fertilizers-Soil profile	
Practical	
<ol style="list-style-type: none"> 1. Soil sample collection 2. Visit to soils of different terrains and study of soil profiles 3. Determination of bulk density, particle density and porosity - cylinder, wax coating and core methods 4. Soil textural analysis - feel method, International pipette method 5. Determination of soil colour and temperature Determination 6. Determination of soil moisture 	

7. Determination of Infiltration rate
8. Determination of hydraulic conductivity
9. Determination of soil pH and EC
10. Estimation of soil organic carbon

TOTAL (L: 30+P:30) = 60 PERIODS

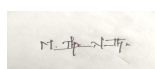
TEXT BOOKS:

1. Brady, N.C. and Raymond, C.Weil. 2013. The Nature and Properties of Soils (14th Edition). Pearson Education, Inc. Publishing as Prentice Hall.
2. Sehgal, J. 2005. Pedology concepts and applications, Kalyani Publishers, New Delhi.
3. Dilip Kumar Das. 2004. Introductory Soil Science, Kalyani Publishers, New Delhi
4. Fundamentals of Soil Science. 2009. ISSS Publication, New Delhi

REFERENCES:

1. Fanning, D.S. and C.B.Fanning. 1989. Soil: Morphology, Genesis and Classification. John Wiley and Sons, New York.
2. Garrison Sposito. 2008. The Chemistry of Soils. Amazon Publishers, India.
3. Ghildyal, B.P. and Tripathi, R.P. 2001. Soil Physics. New Age International Publications.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3			2			2	2				2	2	
2	3			1			2	2				1	1	
3	3			1			1	1				1	1	
4	3	1	2	2			2	1				3	3	
5	3	1	2	2			2	2				3	3	
CO(W.A)	3	1	2	2			2	2				2	2	

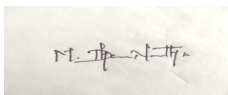


17AGC03 FLUID MECHANICS AND HYDRAULICS					
		L	T	P	C
		4	0	0	4
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: : The students will be able to			
1.0	To study the different properties of fluids	1.1	Involved in design of pipes and channels		
2.0	To gain knowledge on different types of fluid flow	2.1	Apply conceptual knowledge in selection of pipes for water flow		
3.0	To impart knowledge on open channel flow	3.1	Apply knowledge in construction of channels		
4.0	To study the law governing the flow and its measurement	4.1	Apply knowledge in design of drip and sprinkler irrigation system		
5.0	To gain an understanding of flow measurement	5.1	Determine the quantity of water required, water loss etc.		

UNIT I – HYDROSTATICS	(12)
<p>Ideal & real fluids, Properties of fluids – units of measurement – Hydrostatics - Pascal’s Law - proof, Pressure at any point, Fluid pressure and measurement – simple, differential and micro manometers - Mechanical gages</p> <p>Hydrostatic forces on surfaces – total pressure and centre of pressure - Horizontal- vertical and inclined plane surface - Pressure diagram. Archimede’s principles – buoyancy – Centre of Buoyancy - Meta centre – metacentric height</p>	
UNIT II – HYDROKINEMATICS – I	(12)
<p>Types of fluid flow - velocity and acceleration of a fluid particle - Rotational – irrotational – circulation and vorticity, one dimensional, two dimensional, three dimensional flows, continuity equation in Cartesian co-ordinates - Acceleration of fluid particle, convective and local - Stream function, Potential function, stream line, equipotential line, stream tube, path line and steak line - flow net</p> <p>Euler's equation of motion, Bernoulli's equation –applications, Kinetic energy correction factor- Orifices - Flow through orifice under variable head – time of emptying a tank - Flow through pipes – laminar and turbulent flow in pipes - Reynold's experiment, siphon</p>	
UNIT III – HYDROKINEMATICS - II & HYDRODYNAMICS AND MODELS	(12)
<p>Friction loss in pipe flow – Darcy-Weisbach derivation – moody’s chart - power of a fluid flow - Minor losses - Hydraulic gradient line, Total energy line – Impulse-momentum equation – Moment of momentum equation – Water hammer – Gradual and sudden closure of valve</p> <p>Dimensional analysis – Raleigh & Buckingham-pi theorem, Models & similitude - distorted and undistorted models - scale effect - non-dimensional numbers, Reynolds & Froude - concept of geometric, kinematic and dynamic similarity</p>	

UNIT IV - OPEN CHANNEL FLOW – UNIFORM	(12)
Types of flow in channel, velocity distribution, Application of energy – momentum equation - Energy depth relations, Specific energy and critical depth - momentum in open channel flow – specific force – Uniform flow – Chezy - Darcy weisbach - Mannings roughness coefficient, equivalent roughness - Computation of uniform & critical flow - the most economical sections of channel.	
UNIT V - OPEN CHANNEL FLOW – NON-UNIFORM & FLOW MEASUREMENT	(12)
Non-uniform flow in open channels - gradually varied flow- Dynamic equation for gradually varied flow, Relation between water surface & water surface profiles - Rapidly varied flow - hydraulic jump - energy dissipation - types -derivation of energy loss in hydraulic jump - Flow measurement – weirs and notches - cipoletti, triangular, broad crested and submerged, Flumes - parshall and cut-throat	
TOTAL (L: 60) = 60	
PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Rajput, R. K. 2012. “A Textbook of Fluid Mechanics and Hydraulic Machines”, (Revised 2nd Edition), S. Chand and Company Limited, New Delhi. 2. Modi P.N and Seth. 2010. “Hydraulics and Fluid Mechanics including Hydraulic Machines”, Standard Book House, New Delhi. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Douglas, J.F. 2011. “Fluid Mechanics”, (6th Edition), Prentice Hall of India, New Delhi. 2. Roberson J.A and Crowe C.T. 2010. “Engineering Fluid Mechanics”, Jaico Books Mumbai. 3. Fox W.R. and McDonald A.T. 2005. “Introduction to Fluid Mechanics”, John-Wiley and Sons, Singapore. 4. Jain A. K. 2008. “Fluid Mechanics”, Khanna Publishers, New Delhi. 5. Streeter, V.L. Wylie, E. B. and Bedford K.W. 2008 “Fluid Mechanics”, (9th Edition) Tata McGraw Hill, New Delhi. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2										3	
2	3	2	2	3		2							2	
3	3	2	2		2								2	
4	3	3	3	2	2	3							2	
5	3	2	2	2	2	3							3	
CO(W.A)	3	2	2	2	2	3							2	



17AGC04 SURVEYING AND LEVELLING				
			L	T
			3	0
			P	C
			0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The students will be able to		
1.0	To understand the principle, concepts and methods of surveying	1.1	Identify the instruments required for conducting the survey in level and sloping ground	
2.0	To know how to compute area and volume	2.1	Calculate area and volume of earth work needed in construction of farm structures	
3.0	To practice compass traversing and plane table surveying	3.1	Identify the angle between the stations by prismatic compass and conduct the plane table surveying for locating the new station	
4.0	To learn and practice leveling and contouring	4.1	Conduct leveling and contouring in plains and hilly regions for efficient irrigation	
5.0	To gain knowledge in total station survey	5.1	Conduct survey of a given field using Total station	

UNIT I - PRINCIPLES OF SURVEYING	(9)
Introduction - Principles and basic concepts and uses of surveying - classification and basic methods of surveying- Types of chains, Ranging rod, Ranging - Direct and Indirect methods –Method of Chaining on level and sloping ground - Obstacles in chaining.	
UNIT II - COMPUTATION OF AREA AND VOLUME	(9)
Introduction – Formulae for calculation of cross sectional area – calculation of volume - Area computation, Mid-Ordinate rule, Average ordinate rule, Trapezoidal rules, Simpson rule and Coordinate method of finding area-Computation of volume. Computation of Area from field notes and plot plan	
UNIT III - COMPASS TRAVERSING	(9)
Basic terminologies of Compass traversing – Prismatic and Surveyors Compass - Checking the accuracy of traverse - Errors and mistakes in Compass survey - Plane tabling - instruments and accessories - Radiation, Traversing, Orientation - Intersection and Resection.	
UNIT IV - LEVELLING AND CONTOURING	(9)
Levelling - definition - Benchmarks - different types of levels - Basic principles of leveling - Theory of simple, compound, cross sectional and reciprocal levelling -Contouring - definition - contour characteristics - direct and indirect methods -gradient contour - uses – Minor instruments, Hand level - Clinometer - Abney level– Theodolite types – adjustments – setting up – reading angles – measurements – Area and elevation determination.	

UNIT V - TOTAL STATION	(9)
Introduction- Accuracy of a Total Station- Accessories for Total Station- Functions Performed by Total Stations- Applications of Total Station- Remote Elevation Measurement (REM)- Missing Line Measurement (MLM)- Area Calculation- Setting out	
TOTAL(L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Punmia. B.C “Surveying (Vol- I & Vol-II)” Laxmi publications, New Delhi. 1991. 2. Kanetkar, T.P. & Kulkarni, S.V., “Surveying & leveling”. Part –I, A.V.G. Prakashan, Poona. 1984. 3. Basak. V.N, “Surveying and Levelling”, Tata McGraw hill publications, New Delhi. 1994. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Duggal, S.K. 2013 Surveying 4th edition, McGraw hill education (India) Pvt. Ltd. New Delhi 2. Kanetkar, T.P., and S.V. Kulkarni. Surveying and levelling Part II, Pune Vidyarthi Griha Prakashan 3. Bharikatti, S.S. 2013. Surveying Theory and Practice. I.K. international publishing house Pvt.Ltd. NewDelhi 4. Narinder Singh, 1992. Surveying. Tata McGraw hill publishing company Ltd., New Delhi 5. Michael, A.M., and T.P. Ojha. 2009. Principles of Agricultural Engineering, Vol. II, Jain Brothers, New Delhi 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	2					2	2				
2	3	3	3	3					3	1		3	2	2
3	3	3		3	2				3			3		
4	3	3	3	3	3				3	2		2	2	2
5	3	3	3	3	3	3			3	2		2	2	2
CO(W.A)	3	3	3	3	3	3			3	2		3	2	2

17AGC05 MECHANICS OF FARM MACHINES					
		L	T	P	C
		2	2	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To understand the mechanism of kinematics pairs and linkages	1.1	Design suitable farm implements, material handling equipments		
2.0	To learn the mechanism involved in brakes and clutches	2.1	Apply in tractors and power tillers		
3.0	To impart knowledge on gear and gear trains	3.1	Know the mechanism of gear and gear trains		
4.0	To know and understand different types of cam and flywheel	4.1	Understand the working of cam and flywheel		
5.0	To learn about working principle and applications of governors	5.1	Gain knowledge on governors		

UNIT I - INTRODUCTION TO MECHANISM	(6+6)
Definition of a machine - kinematic pair – types – links - types of constrained motion - types of joints - degrees of freedom - Kinematic chain - Classification of kinematic pairs - four bar chain, slider crank chain and their inversions - Mechanical advantages - determination of velocity and acceleration by relative velocity method for simple four bar and slider crank mechanism	
UNIT II - FRICTION AND FRICTION DRIVES	(6+6)
Brakes – band and shoe brakes – Clutches, working principles of single and multiple plate and cone clutches - Power drives - belt drives, types, belt materials, length of belt - power transmitted - velocity ratio - effect of centrifugal tension - creep and slip on power transmission	
UNIT III - GEAR AND GEAR TRAINS	(6+6)
Gear terminology - law of gearing - velocity of sliding between two teeth in a mesh - Involute and cycloidal profile for gear teeth - gears trains - simple, compound, reverted and epicyclic - determining velocity ratio by tabular method	
UNIT IV - CAM AND FLYWHEEL	(6+6)
Cam and follower – types – knife edge, roller and flat faced followers - cam nomenclature – displacement diagram – cam profiles for uniform velocity and acceleration - simple harmonic and cycloidal motion – theory of fly wheel and its applications	
UNIT V - GOVERNORS	(6+6)
Types of governors - constructional details and working of Watt, Porter, Proell and hartnell governors - Sensitiveness, stability, hunting, isochronisms, power and effort of a governor	
TOTAL (L: 30+T:30) = 60 PERIODS	

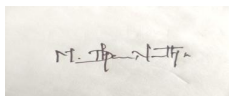
TEXT BOOKS:

1. Rattan, S.S. 1993. Theory of machines, Tata McGraw Hill Publishing Co. New Delhi.
2. Ballaney, P.L. 1994. Theory of machines. Khanna publishers. New Delhi.
3. Jagdish Lal. 1992. Theory and mechanisms and machines. Metropolitan Book Pvt. Ltd. New Delhi

REFERENCES:

1. Rao, J.S. and Dukkippatti, R.V. 1990. Mechanisms and machine theory, Wiley Eastern. New Delhi.
2. Thomas Beven. 1984. Theory of machines, CBS publishers and Distributors, New Delhi

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	2	2	1	1					1	2	
2	3	1				1	1	1	1				2	
3	3		1				1						2	
4	3	1	1										2	
5	3		1		1	2							2	
CO(W.A)	3	1	1	2	2	1	1	1	1			1	2	



17AGC06 THERMODYNAMICS FOR AGRICULTURAL ENGINEERS				
			L	T
			P	C
		2	2	0 3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Students will be able to		
1.0	To know the basic concepts of thermodynamics	1.1	Exemplify the basic concepts and zeroth law of thermodynamics.	
2.0	To study the properties of pure substances	2.1	Determine the thermodynamic properties of pure substances and its phase change processes	
3.0	To know about laws of thermodynamics	3.1	Apply the first law of thermodynamics to closed and steady flow process	
4.0	To impart knowledge on gas power cycles	4.1	Solve the problems related to cycles and cyclic devices using second law of thermodynamics	
5.0	To know about chemical reaction during combustion	5.1	Evaluate various chemical reactions, combustion processes and chemical equilibrium	

UNIT I – BASIC CONCEPTS OF THERMODYNAMICS	(6+6)
Basic concepts of thermodynamics – application areas of thermodynamics – dimensions and units closed and open systems-properties of a system – state and equilibrium – processes and cycles forms of energy and environment –temperature and zeroth law of thermodynamics-pressure and measurements – thermodynamic aspects of biological systems.	
UNIT II – PROPERTIES OF PURE SUBSTANCES	(6+6)
Properties of pure substances – phase and phase change – property tables – ideal gas equation other equation of state – specific heat – internal energy, enthalpy and specific heats of ideal gas – vapour pressure and phase equilibrium – energy transfer by heat, work and mass.	
UNIT III – FIRST LAW OF THERMODYNAMICS	(6+6)
The first law of thermodynamics-energy balance for closed and steady flow systems – energy balance for unsteady processes – the second law of thermodynamics-thermal energy reservoirs – heat engines – energy conversion efficiencies.	
UNIT IV – GAS POWER CYCLES	(6+6)
Gas power cycles – basic consideration in the analysis of power cycles – the Carnot cycle and its values in engineering – reciprocating engines – ottoman cycle – diesel cycle and other cycles-saving fuel – efficiency.	
UNIT V - CHEMICAL REACTIONS	(6+6)
Chemical reactions – fuels and combustion – theoretical and actual combustion processes – enthalpy of formation and combustion – adiabatic flame temperature – second law analysis of reacting systems – fuels cells – chemical and phase equilibrium	
TOTAL (L: 30+T:30) = 60 PERIODS	

TEXT BOOKS:

1. Rajput, R.K. 2010. Fourth edition. Engineering Thermodynamics. Laxmi Publication
2. Nag, P.K. 2014. Second edition. Basic and applied thermodynamics. Tata McGraw Hill Publication

REFERENCES:

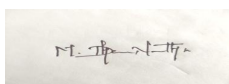
1. Michael J. Moran, and Howard N Shapiro 2000. Fundamentals of Engineering Thermodynamics, John Wiley & Sons. USA.
2. Valan Arasu. A. 2006. Engineering Thermodynamics, Vijay Nicole Imprints Limited Chennai-600029.
3. Vijayaraghavan, G.K. and S.Sundaravalli 2006. Engineering Thermodynamics, Lakshmi Publication, Arapakkam, Sirkali, Nagappatinam – 609 111.
4. Cengel,Y.A and Boles,M.A. Thermodynamics An Engineering Approach, McGraw hill Publication, Fifth edition, 2012

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3			2		2					3	3	
2	3	3					2					2		3
3	3	3	3		2		2	2				2		
4	3	3	3		2		3	2	1		1	1	3	3
5	3	3	1				2		1		1	3	2	
CO(W.A)	3	3	2		2		2	2	1		1	2	3	3

17AGP02 SURVEYING AND LEVELLING LABORATORY				
			L	T
			P	C
		0	0	4
			2	
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes The Students will be able to		
1.0	To practice different types of surveying	1.1	Acquaint with different surveying methods	
2.0	To gain knowledge on computation of area by different methods	2.1	Select suitable method of survey to the given filed	
3.0	To know the use of Dumpy level	3.1	Determine the contours	
4.0	To practice on leveling	4.1	Calculate area and volume of earth work needed in construction of farm structures	
5.0	To gain knowledge and practice on Theodolite surveying	5.1	Conduct leveling and contouring in plains and hilly regions	

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Linear measurement and offset setting 2. Area computation by cross staff survey and plotting 3. Compass Survey – radiation method-Closed compass traversing, Plotting and correction of closing error 4. Open compass traversing-Problems on Compass traversing 5. Differential levelling problems-Cross-sectioning – plotting 6. Contouring – Direct & Grid method-Plotting of contour - preparation of map - Computation of volume 7. Cross sectioning with theodolite and plotting -Traversing with a Theodolite - Plotting theodolite survey 8. Area and elevation determination by measuring horizontal and vertical angles-Volume of earthwork computation 9. Missing Line Measurement Using Total Station 10. Area measurement using Total Station 11. Study on layout preparation using total station
TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2		2	2										
2	2	2	3	2	2									
3	2	2	3	3	3									
4	2	2	3	3	3								1	
5	2	2	3	2	3								1	
CO(W.A)	2	2	3	2	3								1	



17AGP03 FLUID MECHANICS AND HYDRAULICS LABORATORY				
		L	T	P
		0	0	4
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes The Students will be able to		
1.0	To study the different properties of fluids	1.1	Design of pipes and channels	
2.0	To gain knowledge on different types of fluid flow	2.1	Apply conceptual knowledge in selection of pipes for water flow	
3.0	To impart knowledge on open channel flow	3.1	Imply in constructional knowledge of channels	
4.0	To study the law governing the flow and its measurement	4.1	Apply in design of drip and sprinkler irrigation system	
5.0	To gain an understanding of flow measurement	5.1	Determine the quantity of water required, water loss etc.	
LIST OF EXPERIMENTS:				
<ol style="list-style-type: none"> 1. Verification of Bernoulli's theorem experimentally 2. Determination of coefficient of discharge of Venturimeter 3. Determination of coefficient of discharge of Orificemeter 4. Calculation of rate of flow using Rotameter 5. Determination of pipe frictional loss 6. Determination of minor energy losses in pipe fittings 7. Calculation of flow of water through Notch apparatus 8. Calculation of discharge of fluid through Pitot tube 9. Determination of Metacentric height 10. Conducting experiments and drawing the characteristic curves of reciprocating pump 11. Conducting experiments and drawing the characteristic curves of centrifugal pump 				
TOTAL (P: 60) = 60 PERIODS				

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	2		2	1	1	1	1					
2	2	1	1		1	1	1						1	
3	2	1	1		2	1	1						1	
4	3		2		1	2	1	1					2	
5	2	2	1	1									2	
CO(W.A)	2	2	1	1	2	1	1	1	1				2	

M. J. P. N. T. P.

17GED01 – SOFT SKILLS – LISTENING AND SPEAKING				
			L	T
			0	0
PREREQUISITE : NIL			QUESTION PATTERN : TYPE – NIL	
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Students will be able to		
1.0	To recollect the functional understanding of basic grammar and its structure.	1.1	Apply the knowledge of basic grammar to classify the types of verbs and questions and to construct the sentences.	
2.0	To acquire the listening skills through note completion, matching and multiple choice modes.	2.1	Develop the listening skills through note completion, matching and multiple choice modes.	
3.0	To develop speaking skills through self introduction, short talk and topic discussion.	3.1	Organize a presentation on the given topic.	

UNIT I – GRAMMAR	(10)
Tenses - Verb (Auxiliary and Modal) - 'Yes/No' Type Questions - Reported Speech - Gerund - Phrasal Verbs	
UNIT II – LISTENING	(10)
Part I : Note completion Part II: Matching Part III: Multiple Choice	
UNIT III- SPEAKING	(10)
Part I : Self Introduction Part II: Short talk on business topics Part III: Discussion in pairs	
TOTAL (L: 30) = 30 PERIODS	
REFERENCES:	
1. Murphy, Raymond, "Essential Grammar in Use", Cambridge University Press, UK, 2007	
2. Whitby, Norman,"Business Benchmark Pre- Intermediate to Intermediate Preliminary, 2 nd ed., Cambridge University Press, 2013.	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1									3		3	3		
2									3		2	3		
3									3		3	2		
CO(W.A)									3		3	3		

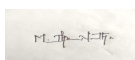
M. J. P. N. T. A.

17MYB06 STATISTICS AND NUMERICAL METHODS (Common to Agriculture and Mechanical Branches) [Use of Normal, t, F and Chi-square Tables permitted]					
		L	T	P	C
		2	2	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – IV			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes : The Students will be able to			
1.0	To provide students with the foundations of probabilistic and statistical analysis.	1.1	Understand the common statistical techniques.		
2.0	To understand the knowledge of design of experiments.	2.1	Apply Analysis of Variance for the data set of selected number factors for analyzing the significance		
3.0	To understand the method of solving algebraic and transcendental equations using direct and indirect method.	3.1	Apply the suitable numerical techniques to solve practical engineering problems.		
4.0	To understand the numerical methods of interpolation and integration.	4.1	Demonstrate the concept of interpolation and numerical integration when dealing with empirical data sets.		
5.0	To introduce the numerical solution methods for solving ordinary differential equations	5.1	Make use of numerical methods in the solution of ordinary differential equations which are useful in solving engineering problems		

UNIT I : STATISTICS	(6+6)
Introduction of basic statistics – Probability distributions: Binomial, Poisson and Normal – Evaluation of statistical parameters for these three distributions – Regression and correlation.	
UNIT II :TESTING OF HYPOTHESIS	(6+6)
Introduction to Sampling distributions – Large Sample –Tests for single mean, Difference of means – Small sample – Students t-test - F-test -Chi-square test for goodness of fit – Independence of attributes using Binomial distribution.	
UNIT III: SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS	(6+6)
Newton Raphson method – Direct methods – Gauss Elimination method – Gauss Jordan method – Iterative methods – Gauss Jacobi and Gauss Seidel method – Matrix Inversion by Gauss Jordan method.	
UNIT IV : INTERPOLATION AND NUMERICAL INTEGRATION	(6+6)
Lagrange’s and Newton’s divided difference interpolation - Newton’s forward and backward difference interpolation –Numerical Integration using Trapezoidal rule and Simpson’s rule.	

UNIT V : NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	(6+6)
Taylor's series method - Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order and simultaneous equations - Adam's and Milne's predictor and corrector methods for solving first order equations.	
TOTAL (L: 30+T:30) = 60	
PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi- 2006. 2. P.Kandasamy, K.Thilagavathy and K.Gunavathy, "Numerical Methods", S.Chand& Co. Ltd. New Delhi, 2003. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Spiegel, M.R. J. Schiller and Srinivasan. R.A, "Schaum's Outlines Probability and Statistics", 3rd ed., Tata McGraw Hill, New Delhi, 2010. 2. Chapra.C, Steven and Canale. P, Raymond, "Numerical Methods for Engineers", 5th ed., Tata McGraw Hill, New Delhi, 2007. 3. T.Veerarajan and T.Ramachandran, "Numerical methods with Programming in C", 2nd edition, Tata McGraw Hill 2006, Eighth reprint-2011. 4. Jay L.DeVore,"Probability And Statistics for Engineering and the Sciences" , 8thed, Cengage learning, 2011. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3		2	2		3					2		
2	3	3		2	2						1	2		
3	3	3		2	2		3				1	2		
4	3	3		2	2							2		
5	3	3		2	2		3				1	2		
CO(W.A)	3	3		2	2		3				1	2		



17AGC07 HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERS				
			L	T
			2	2
			P	C
			0	3
PREREQUISITE : 17AGC06		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Students will be able to		
1.0	To gain knowledge on conduction, and laws governing conduction heat transfer	1.1	Impart concept on conduction mode of heat transfer in concentration and drying of food materials	
2.0	To impart the knowledge on the laws governing convection mode of heat transfer	2.1	Impart concept on convection mode of heat transfer in concentration and drying of food materials	
3.0	To study about the radiation mode of heat transfer and laws governing	3.1	Impart concept on radiation mode of heat transfer in concentration and drying of food materials	
4.0	To analyze and evaluate the performance of heat exchangers	4.1	Design heat exchanger for effective heat utilization	
5.0	To gain knowledge on mass transfer and the law's governing	5.1	Apply knowledge in mass transfer mechanism	

UNIT I – HEAT TRANSFER – CONDUCTION	(6+6)
Basic transfer processes – heat, mass and momentum – heat transfer process – conductors and insulators – conduction – Fourier's fundamental equation – thermal conductivity and thermal resistance – linear heat flow – heat transfer through homogenous wall, composite walls, radial heat flow through cylinders and sphere – solving problems in heat transfer by conduction.	
UNIT II – HEAT TRANSFER – CONVECTION	(6+6)
Newton Rikhman's law – film coefficient of heat transfer – convection – free and forced convection – dimensional analysis and its application – factors affecting the heat transfer coefficient in free and forced convection heat transfer – overall heat transfer coefficient – solving problems in heat transfer by convection.	
UNIT III – HEAT TRANSFER: RADIATION	(6+6)
Radiation heat transfer – concept of black and grey body - monochromatic total emissive power – Kirchoff's law – Planck's law – Stefan-Boltzman's law – heat exchange through non-absorbing media – solving problems in heat transfer by radiation.	
UNIT IV – HEAT TRANSFER – HEAT EXCHANGER	(6+6)
Heat exchangers – parallel, counter and cross flow – evaporator and condensers - Logarithmic Mean Temperature Difference – overall coefficient of heat transfer – tube in tube heat exchanger, shell and tube heat exchanger, plate heat exchanger – fouling factor – applications of heat exchangers – solving problems in heat exchangers.	

UNIT V – MASS TRANSFER	(6+6)
Mass transfer – introduction – Fick’s law for molecular diffusion – molecular diffusion in gases – equimolar counters diffusion in gases – diffusion through a varying cross sectional area – diffusion coefficients for gases – molecular diffusion in liquids.	
TOTAL (L: 30+30) = 60 PERIODS	

TEXT BOOKS:

1. Geankoplis C.J.2017. Fourth edition. Transport Processes and Separation Process Principles. Pearson India Education Services Pvt. UP.
2. R.K.Rajput. 2002. Heat and mass transfer. S.Chand and company, Ram Nagar, NewDelhi.

REFERENCES:

1. Jacob and Hawkins. 1983. Elements of Heat Transfer. John Willey and Sons Inc.Ne York.
2. Eckert, E.R.G. 1981. Heat and Mass Transfer. McGraw Hill Book Co., New York.
3. Holman, E.P.2001. Heat Transfer. McGraw-Hill Publishing Co. New Delhi.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	1										2
2	3	3	1	2	2									2
3	3	3	2		2							1		2
4	2	3	3	2					3			2	3	3
5	3	3	1	2	2								2	3
CO(W.A)	3	3	2	2	2				3			2	3	2

17AGC08 CROP PROCESS ENGINEERING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To know the importance of moisture content during harvesting, threshing and storage of non perishable crops	1.1	Predict moisture content of crop and use threshing techniques to minimize post-harvest losses.		
2.0	To gain knowledge on engineering properties and psychrometry and its uses	2.1	Design material handling equipment, storage structures and dryers for different type of crops		
3.0	To know the different types of cleaning, grading and material handling equipments	3.1	Recommend cleaners, graders and conveying equipment.		
4.0	To acquire knowledge on availability of different dryers and storage structures	4.1	Design drying and storage structure to minimize post-harvest losses		
5.0	To gain knowledge on milling of cereals, pulses and oil seeds	5.1	Use various technique to minimize post-harvest losses during milling		

UNIT I – INTRODUCTION	(9)
Post harvest engineering – introduction – objectives – post harvest losses of cereals, pulses and oilseeds – importance – optimum stage of harvest. Threshing – traditional methods mechanical threshers – types – principles and operation –moisture content – measurement - direct and indirect methods – moisture meters – equilibrium moisture content.	
UNIT II – PHYSICAL PROPERTIES AND PSYCHROMETRY	(9)
Physical properties of agricultural produces. Psychrometry – importance – Psychrometric charts and its uses –humidification operations, gas-liquid contents, gas laws and their application in determining psychrometric properties of air-water-vapour mixture.	
UNIT III – CLEANING, GRADING AND MATERIAL HANDLING	(9)
Principles – air screen cleaners – types – adjustments – cylinder separator – spiral separator – magnetic separator –colour sorter – inclined belt separator – length separators – effectiveness of separation and performance index. Different types of graders for cereals, pulses and oil seed crops. Materials handling – belt conveyor – screw conveyor – bucket elevators – pneumatic conveying.	
UNIT IV – DRYING AND STORAGE	(9)
Drying – principles and theory of drying – thin layer and deep bed drying – Hot air drying – methods of producing hot air – Types of grain dryers – selection – construction, operation and maintenance of dryers – Design of dryers. Direct and indirect types of damages – sources of infestation, traditional and modern types of storage structures – vertical, horizontal and underground storages – storage structure designs.	

UNIT V – PROCESSING OF CEREALS, PULSES AND OILSEEDS	(9)
<p>Paddy processing – parboiling of paddy – methods – merits and demerits – dehusking of paddy – methods – merits and demerits – rice polishers – types – constructional details – polishing – layout of modern rice mill – performance evaluation of modern mills. Wheat milling. Pulse milling methods – Wet, Dry, CFTRI, CIAE, Punjab. Oil seed processing. Principles and operation – maize sheller, husker sheller for maize – groundnut decorticator – castor sheller.</p>	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Chakraverty, A. 2017. Third Edition. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing & Co. Pvt. Ltd., New Delhi. 2. Sahay, K.M. and K.K. Singh. 2004. Second revised and enlarged edition. Unit operations in Agricultural Processing, Vikas Publishing House Pvt. Ltd., New Delhi, 3. Ojha, T.P. and A.M. Michael. 2018. Tenth edition. Principles of Agricultural Engineering. Vol.- 1. Jain Brothers, New Delhi. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Henderson, S.M. and R.L.Perry. 1995. Agricultural process engineering, John Willey and Sons, New York. 2. Pandey, P.H. 1994. Principles of agricultural processing, Kalyani Publishers, Ludhiana, 3. N.N. Mohsenin, Physical Properties of Plant And Animal Materials, Gordon and Breach publishers, New York, 1986 4. W.L. McCabe and J.C. Smith, Seventh Edition. Unit Operations of Chemical Engineering, McGraw Hill Education (India) Pvt. Ltd, Tokyo, 2015 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1										1		2
2	3	2		1	1				1		1	2		3
3	3	2	2	2	1				1		1	1	2	3
4	3	3	3	2					1		1	1	2	3
5	3	2	2	2	2				1		1	1	2	3
CO(W.A)	3	2	2	2	1				1		1	1	2	3

17AGC09 FARM TRACTOR SYSTEMS						
			L	T	P	C
			3	0	0	3
PREREQUISITE : 15AGC05			QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:						
Course Objectives			Course Outcomes: The Students will be able to			
1.0	To gain knowledge on classification of tractors, tractor engines	1.1	Categorize and suggest different tractors and their functions.			
2.0	To impart the knowledge on working of engine system	2.1	Calculate valve timing and represent by a diagram and rectify problems in the tractors.			
3.0	To know about the power transmission mechanism	3.1	Impart knowledge on effective transmission of power and braking system			
4.0	To develop skills on safe and efficient use of tractors	4.1	Apply knowledge on hydraulic system in a tractor and estimate the traction.			
5.0	To acquire knowledge on test procedure to assess the performance of tractors and power tillers	5.1	Test and assess the performance of tractors and power tillers			

UNIT I – TRACTORS	(9)
Classification of tractors – Tractor engines – Principles of operation of IC engines – construction of engine blocks, cylinder head and crankcase – features of cylinder, piston, connecting rod and crankshaft – firing order – combustion chambers.	
UNIT II – ENGINE SYSTEMS	(9)
Valves – inlet and outlet valves – valve timing diagram. Air cleaner – exhaust – silencer – Cooling systems – lubricating systems – fuel system – properties of fuels – governor – electrical system – engine trouble shooting.	
UNIT III – TRANSMISSION SYSTEMS	(9)
Transmission – clutch – gear box – sliding mesh – constant mesh – synchro mesh – Differential, final drive and wheels – Steering geometry – steering systems – front axle and wheel alignment – wheel ballasting – Brake – types – system.	
UNIT IV – HYDRAULIC SYSTEMS	(9)
Hydraulic system – working principles, three point linkage – draft control – weight transfer, theory of traction – tractive efficiency – tractor chassis mechanics – stability – longitudinal and lateral – Controls – visibility – operators seat – tractor safety.	
UNIT V – POWER TILLER AND TRACTOR TESTING	(9)
Power tiller – special features – clutch – gear box – steering and brake – Makes of tractors and power tillers – Types of tests – test procedure – need for testing & evaluation of farm tractor –Test code for performance testing of tractors and power tillers.	
TOTAL (L: 45) = 45 PERIODS	

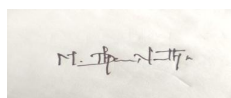
TEXT BOOKS:

1. Jain, S.C. and C.R. Rai. 2016. Third Edition. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi.
2. Sanjay Kumar. 2014. Farm power resources and technologies. Kalyani Publishers. Ludhiana. Punjab.

REFERENCES:

1. Barger, E.L., J.B. Liljedahl and E.C. McKibben, 1997. Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi.
2. Domkundwar A.V. 1999. A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi.
3. Black, P.O. 1996. Diesel engine manual. Taraporevala Sons & Co., Mumbai.
4. Grouse, W.H. and Anglin, D.L. 1993. Automotive mechanics. Macmillan McGraw- Hill, Singapore.
5. Indian Standard Codes for Agril. Implements. Published by ISI, New Delhi.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3			3								2	
2	3	3			2								2	
3	3	3			3								2	
4	3	3	2	2	3								2	
5	3	3	3	3	3	1		1			2	1	2	
CO(W.A)	3	3	3	3	3	1		1			2	1	2	



17AGC10 HYDROLOGY AND WATER RESOURCES ENGINEERING					
		L	T	P	C
		2	2	0	3
PREREQUISITE : 17AGC03		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes The Students will be able to		
1.0	To acquire knowledge on hydrologic cycle	1.1	Determine the loss of water and hydrologic cycle.		
2.0	To understand the importance and measurement of infiltration and runoff	2.1	Measure increase infiltration rate, groundwater level and minimize runoff		
3.0	To know about the importance of hydrograph	3.1	Analyze water levels and flood.		
4.0	To gain knowledge on groundwater flow	4.1	Apply concept to increase groundwater level and effective utilization		
5.0	To understand the well hydraulics so as to locate wells for the extraction of ground water	5.1	Locate and effectively utilize the groundwater		

UNIT I – HYDROLOGIC CYCLE AND INITIAL LOSSES	(6+6)
Hydrology - Introduction – scope - definition, Water Resources of Globe & India, hydrologic cycle - Precipitation –measurement of precipitation, Raingauge network - Missing data - consistency of data, Arithmetic mean - Thiessen polygon – Isohyetal - Rainfall-depth-area-duration and Intensity-area-duration, Frequency analysis - Probable maximum precipitation, Indian summer monsoon rainfall, southern oscillation, El Nino, LaNina - Abstraction from precipitation – evaporation - energy budget method, Evapotranspiration - interception, depression storage, Infiltration - mechanics – Factors.	
UNIT II – INFILTRATION & RUNOFF	(6+6)
Infiltration measurement – Horton – Philips – Kostiakov - Greenampt, Infiltration indices - ϕ index - W index - Stream types – flow measurement, Velocity measurement, direct, indirect methods – Slope-area, stage-discharge relations – Run off process, Hydrograph, SCS-CN method.	
UNIT III – HYDROGRAPH	(6+6)
Hydrograph - base flow separation - Unit hydrograph – theory-applications - ‘S’ curve – Floods – peak flow – Rational method.- empirical methods – Flood frequency analysis, Flood routing – basics – level pool method – channel routing.	
UNIT IV – GROUNDWATER FLOW	(6+6)
Groundwater – development - potential in India, Aquifer properties, Land subsidence due to groundwater withdrawal - Types of aquifer - Movement of groundwater – Darcy’s law - Anisotropy, Water table contour maps, Flow net analysis - Groundwater flow potential, unconfined-steady 1-d flow - with recharge, confined 1d-flow. Continuity equation –derivation - Hydraulics of wells, steady-radial flow into wells, unsteady state confined aquifer -Theis method, Jacob method.	

UNIT V - WELLS	(6+6)
<p>Recuperation test, Leaky artesian aquifer - unsteady radial flow - Unconfined aquifer - unsteady radial flow, Image well theory - Partially penetrating wells, Well losses - Step draw down test – yield - Geophysical investigation - Surface methods, Subsurface methods, Wells – design-diameter, depth, screen, Open well versus bore wells, design-bore wells, infiltration galleries, Well development - yield testing.</p>	
TOTAL (L: 30+T:30) = 60	
PERIODS	
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Michael, A.M. 2009. Irrigation: Theory and Practices, Vikas Publishing House Pvt., Limited. 2. Raghunath, H.M. 2011. Groundwater, New Age International(p) Ltd., New Delhi 3. Subramanya, K. 2013. Engineering Hydrology, Tata McGraw Hill pub. Co. New Delhi <p>REFERENCES:</p> <ol style="list-style-type: none"> 1. Mutreja.K.N.1990, Applied Hydrology, Tata McGraw Hill pub. Co. New Delhi 2. Ven te chow, David R.Maidment, LarryW.Mays, Applied Hydrology, McGraw Hill pub. Co. New Delhi. 	

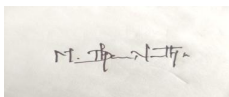
COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2		2	2		3					3	3	
2	3	3	2	3	3		3		3		3	2	2	
3	3	3		3	2		3					3	3	
4	3	2	2	2	2		3					3	3	
5	3	2	2	2	2		3		3		2	2	2	
CO(W.A)	3	2	2	2	2		3		3		3	3	3	

17AGC11 MECHANICS OF MATERIALS					
		L	T	P	C
		2	2	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To develop theoretical and practical basics of stresses and strains	1.1	Apply the concepts of mechanics of deformable solids in different applications		
2.0	To understand the importance of centroid and centre of gravity	2.1	Imply concept of stress and strain in designing farm structures		
3.0	To gain knowledge to analyze framed structures	3.1	Solve solid mechanics related engineering problems in systematic methods		
4.0	To gain knowledge on cantilever beams and simply supported beams	4.1	Construct storage godowns and farm structures		
5.0	To know about the column, shells and shafts and the laws governing	5.1	Construct farm structures		

UNIT I - BASICS OF STRESSES AND STRAINS	(6+6)
Simple Stresses and Strains – Hooke’s Law – Modulus of Elasticity – Principle of Superposition – bars of varying sections – thermal stresses and strains – Elastic Constants – Poisson’s Ratio – Bulk Modulus – Shear Modulus – interrelationships – Strain Energy and Impact Loading – Proof Resilience – Modulus of Resilience – Principal Stresses and Strains – Oblique sections – Analytical method – Graphical method (Mohr’s Circle method)	
UNIT II - CENTRE OF GRAVITY AND MOMENT OF INERTIA	(6+6)
Centroid and Centre of Gravity – geometrical considerations – method of moments – Plane (laminae) sections - symmetrical sections – unsymmetrical sections – solid bodies and sections with cut out holes –Moment of Inertia – Routh’s rule – method of integration – Theorem of Parallel axes – Theorem of Perpendicular axes – geometric sections - solid and hollow sections – composite and built-up sections	
UNIT III - ANALYSIS OF FRAMED STRUCTURES (TRUSSES)	(6+6)
Structures built of Frames - Types of Frames –Perfect and imperfect frames – deficient and redundant frames – Loads and stresses – Method of Joints – Method of sections – Graphical method – Bow’s notations – polar diagram – funicular polygon – vector diagram – cantilever trusses – freely supported trusses –King Post and Queen Post Trusses	
UNIT IV - SHEAR FORCE, BENDING MOMENT AND DEFLECTION (BEAMS)	(6+6)
Cantilever beams and simply supported beams – continuous beams and overhanging beams – Uniformly distributed load and gradually varying load – Shear Force and Bending Moment distributions – Theory of Simple Bending - Bending stress – modulus of section – deflection in beams and cantilevers – Double integration method – Macaulay’s method.	

UNIT V - COLUMNS, SHELLS AND SHAFTS	(6+6)
Columns and struts – Slenderness ratio – Buckling and crushing - Euler’s Column theory – applications – Rankine’s formula – Johnson’s formula – Indian Standards – Shells – Cylindrical and spherical shells – thin and thick shells – Shafts – torsion in circular shafts – Polar Moment of Inertia – strain energy due to torsion.	
TOTAL (L: 30+T:30) = 60 PERIODS	
TEXT BOOKS: <ol style="list-style-type: none"> Bhavikatti,S.S. 2008. Engineering Mechanics, 3rd edition, New Age International. Punmia, B.C., A.K. Jain and A.K. Jain, 2002. Strength of Materials, Firewall Media. Ramamrutham, S. (2008). Strength of Materials. 16th edition. Dhanpat Rai Publishing Co., India REFERENCE: <ol style="list-style-type: none"> Rajput, R.K. (2010). Strength of Materials (Mechanics of Solids). 4th edition. S.Chand & Company Ltd. India 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3		2								2	2	3
2	3	3	2	1		1	1					2	3	3
3	3	3	1	1								2	2	3
4	3	3	2	2	1	1	1	1	1			2	2	2
5	3	3	1	2	1	1	1	1	1			2	1	2
CO(W.A)	3	3	2	2	1	1	1	1	1			2	2	3



17AGP04 CROP PROCESS ENGINEERING LABORATORY					
		L	T	P	C
		0	0	4	2
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To know the moisture content determination methods	1.1	Minimize post harvest loss during storage, milling		
2.0	To gain knowledge to determine engineering properties of agricultural produces and products	2.1	Design various post harvest equipments		
3.0	To know the different types of cleaning, grading equipments	3.1	Design cleaners and graders		
4.0	To gain knowledge on different material conveying equipments	4.1	Design different conveying equipment		
5.0	To know the shelling methods of cereals	5.1	Design or alter the existing methods to minimize post harvest loss		

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Determination of moisture content of grains, potato slice by oven-dry method and draw the drying characteristic curves 2. Determination of true density, bulk density and porosity of grains 3. Determination of coefficient of friction and angle of repose of grains 4. Evaluation of efficiency of grain cleaning cum grading machine 5. Evaluation of cleaning efficiency of spiral separator 6. Evaluation of cleaning efficiency of inclined belt separator 7. Determination of conveying efficiency of bucket elevator 8. Determination of conveying efficiency of screw conveyor 9. Performance evaluation of paddy parboiling drum 10. Evaluation of shelling efficiency of rubber roll sheller 11. Visit to modern rice mill / pulse / oil milling industries / flour industries
TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1			2	2			1				2	3
2	3	2	2		1				2				2	3
3	3	2	2			2							2	3
4	3	2	2		2	2			1				2	3
5	3	2	2		1	3							3	3
CO(W.A)	3	2	2		2	2			1				2	3

M. J. S. S. S.

17AGP05 FARM TRACTORS AND ENGINES LABORATORY				
		L	T	P
		0	0	4
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Students will be able to		
1.0	To gain knowledge on classification of tractors, tractor engines	1.1	Suggest suitable tractor for different field	
2.0	To impart the knowledge on working of engine system	2.1	Apply knowledge for effective utilization of power	
3.0	To know about the power transmission mechanism	3.1	Utilize effective power transmission.	
4.0	To develop skills on safe and efficient use of tractors	4.1	Avoid accidents at farm level	
5.0	To acquire knowledge on test procedure to assess the performance of tractors and power tillers	5.1	Test tractors and power tillers	

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Study the working of two stroke and four stroke cycle SI and CI engines. 2. Study the valve system of an internal combustion engine and drawing valve timing diagram 3. Study of cooling system of tractor engine 4. Study of an engine lubrication system 5. Study of air cleaners of tractor engine 6. Study of gear transmission system 7. Study of differential and final drive of a tractor 8. Study of steering mechanism of a tractor 9. Study of fuel supply system of tractor engine 10. Study of tyres, rims and ballasting methods of a tractor 11. Study of clutches and brakes
TOTAL (P: 60) = 60 PERIODS

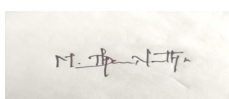
COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		1		2	1		2				2	2	
2	3		1		1	1		2					2	
3	3		1		1	1		2					2	
4	3		1		1	1		2					2	
5	3		1		1	1		2					2	
CO(W.A)	3		1		1	1		2				2	2	

M. J. J. J. J. J.

17GED02 – SOFT SKILLS – READING AND WRITING					
		L	T	P	C
		0	0	2	0
PREREQUISITE : NIL			QUESTION PATTERN : TYPE – NIL		
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Students will be able to		
1.0	To recollect the functional understanding of parts of speech and basic grammar.	1.1	Apply the knowledge to identify the parts of speech and construct the sentences.		
2.0	To acquire the reading skills through cloze texts, matching and multiple choice modes.	2.1	Develop the reading skills through cloze texts, matching and multiple choice modes.		
3.0	To enhance the writing skills for a variety of purposes.	3.1	Interpret effectively through writing for a variety of purposes.		

UNIT I – GRAMMAR	(10)
Articles - Adjectives - Conjunctions - Prepositions - Idioms & Phrases.	
UNIT II – READING	(10)
Part I : Matching 7 sentences to four short texts Part II: Text with sentences missing Part III: Text with multiple choice questions Part IV: Text with multiple choice gaps Part V: Identification of additional unnecessary words in text	
UNIT III- WRITING	(10)
Part I : E-mail writing, Writing short notes, Memo, Agenda & Minutes Part II: Report Writing, Complaint Letter, Writing Proposals	
TOTAL (L: 30) = 30 PERIODS	
REFERENCES:	
1. Murphy, Raymond, “Essential Grammar in Use”, Cambridge University Press, UK, 2007.	
2. Whitby, Norman, “Business Benchmark Pre - Intermediate to Intermediate Preliminary”, 2 nd ed., Cambridge University Press, 2013	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3		3								2		
2	3			3	2									
3	3					3					3			
CO(W.A)	3	3		3	2	3					3	2		



17AGC12 UNIT OPERATIONS IN AGRICULTURAL PROCESSING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : 17AGC08		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To acquire basic knowledge in engineering process like evaporation and concentration	1.1	Select and design suitable evaporators for different agricultural processing		
2.0	To know about the different mechanical separation involved in agricultural processing	2.1	Select suitable mechanical separators for different agricultural processing		
3.0	To understand the basic concept involved in various size reduction equipments for agricultural processing	3.1	Calculate, select and design suitable size reduction machineries for various agricultural processing operations		
4.0	To know the various crystallization and distillation process	4.1	Apply crystallization and distillation process in agricultural processing		
5.0	To understand membrane separation process	5.1	Apply membrane separation process in food processing		

UNIT I - EVAPORATION AND CONCENTRATION	(9)
Unit operations in food processing –conservation of mass and energy – overall view of an engineering process-dimensions and units – dimensional and unit consistency – dimensionless ratios-evaporation – definition – liquid characteristics – single and multiple effect evaporation – types of evaporators – performance of evaporators and boiling point elevation – capacity – economy and heat balance – evaporation of heat sensitive materials.	
UNIT II - MECHANICAL SEPARATION	(9)
Filtration – definition –filter media – types and requirements-constant rate filtration – constant pressure filtration – filter cake resistance-filtration equipment – rotary vacuum filter – filter press-sedimentation – gravitational sedimentation of particles in a fluid – Stoke’s law, sedimentation of particles in gas-cyclones – settling under sedimentation and gravitational sedimentation-centrifugal separations – rate of separations – liquid-liquid separation – centrifuge equipment.	
UNIT III - SIZE REDUCTION, MIXING AND BLENDING	(9)
Size reduction – grinding and cutting – principles of comminuting – characteristics of comminuted products – particle size distribution in comminuted products-energy and power requirements in comminuting – crushing efficiency – Rittinger’s, Bond’s and Kick’s laws for crushing-size reduction equipments – crushers – jaw crusher, gyratory crusher-crushing rolls – grinders – hammer mills – rolling compression mills - attrition, rod, ball and tube mills – construction and operation- Mixing-kneading-blending- emulsification-homogenization.	
UNIT IV – CRYSTALLIZATION AND DISTILLATION	(9)
Crystallization – equilibrium – solubility and equilibrium diagram – rate of crystal growth – equilibrium crystallization-crystallization equipment – classification – construction and operation-tank, agitated batch, Swenson-Walker vacuum crystallizers. Distillation – binary mixtures – flash and differential distillation-steam distillation – theory – consumption – continuous distillation with rectification –	

vacuum distillation - batch distillation – operation and process – advantages and limitations - azeotropic distillation-distillation equipments – construction and operation – factors influencing the operation

UNIT V - MEMBRANE SEPARATION **(9)**

Membrane separation-osmosis –ultra filtration- reverse osmosis-rate of flow through membranes-The van't Hoff equation-membrane equipment.

TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Geankoplis C.J. 2017. Fourth edition. Transport Processes and Separation Process Principles. Pearson India Education Services Pvt. UP.
2. K. M. Sahay and K.K.Singh, Unit operations of Agricultural Processing, Vikas Publishing House Pvt. Ltd., New Delhi, 2004. (Second revised and enlarged edition).

REFERENCES:

1. J.M. Coulson and J.F. Richardson, Chemical Engineering, Volume I to V. The Pergamon Press, New York, 1999.
2. W.L. McCabe, J.C.Smith and P.Harriot, Unit Operations of Chemical Engineering, McGraw-Hill. Inc. Kosaido Printing Ltd. Tokyo, Japan, 2001.
3. R.L.Earle and M.D. Earle. 1989 Second edition. Unit Operations in Food Processing. The New Zealand Institute of Food Science and Technology Inc.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	2	3		2			3	2	2	3
2	3	3	2	1	1	3		2			1	2	1	3
3	3	3	3	2	2	3					3	2		3
4	3	3	1	1	2	2		2			3		2	3
5	3	3	1	1		2		2			1			3
CO(W.A)	3	3	2	2	2	3		2			2	2	2	3

17AGC13 FARM IMPLEMENT AND EQUIPMENT					
		L	T	P	C
		2	0	2	3
PREREQUISITE : 17AGC09		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To gain knowledge on various farm mechanization operations	1.1	Effectively utilize the implements for better production		
2.0	To impart knowledge on primary tillage implements	2.1	Select and calculate the forces involved in primary tillage implements		
3.0	To impart knowledge on secondary tillage implements	3.1	Select and adjust the various secondary tillage implements		
4.0	To understand the basic principle involved and methods of sowing equipment	4.1	Select and test the sowing equipment		
5.0	To know the fertilizer application methods	5.1	Select suitable fertilizer applicators		

UNIT I – FARM MECHANIZATION	(6)
Farm mechanization – status and challenges. Tillage – methods – primary tillage implements – secondary tillage implements – animal drawn ploughs – construction. Types of farm implements – trailed, mounted and semi mounted implements. Field capacity.	
UNIT II – PRIMARY TILLAGE IMPLEMENTS	(6)
Mould board plough – attachments – mould board shapes and types. Forces acting on tillage tool – mould board plough. Disc plough – force representation on disc – Types of disc ploughs – Subsoiler plough – Rotary plough – spading machine – coir pith applicators.	
UNIT III – SECONDARY TILLAGE IMPLEMENTS	(6)
Cultivators – types – construction – adjustments. Disc harrows – Bund former – ridger – leveller. Basin lister – Wetland preparation implements – puddler – cage wheel – leveller. Hitch systems – vertical and horizontal hitching of pull type and mounted implements – force analysis on trailed, mounted and semi mounted implements.	
UNIT IV – SOWING EQUIPMENT	(6)
Crop planting – methods – row crop planting systems. Seeding machines – Devices for metering seeds – furrow openers – furrow closers – types – Types of seed drills and planters.	
UNIT V – FERTILIZER APPLICATION	(6)
Drill calibration – application of fertilizers – metering devices – seed cum fertilizer drill – application of liquid fertilizers.	

Practical

1. Operation of tractor drawn mould board plough – adjustments and determination of field capacity
2. Operation of tractor drawn disc plough – adjustments and determination of field capacity
3. Operation of tractor drawn cultivator – adjustments and determination of field capacity
4. Operation of subsoiler – adjustments and determination of field capacity
5. Study on Calibration of seed drills
6. Operation of paddy drum seeder in the field and determination of field capacity
7. Dismantling, parts identification and assembly of different components of knapsack power sprayer and duster
8. Field testing of rocker arm sprayer, power sprayer and their maintenance
9. Study of different types of nozzles and analysis of spray pattern
10. Determination of operational cost of farm implement

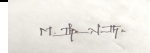
TOTAL (L: 30+P:30) = 60 PERIODS**TEXT BOOKS:**

1. Jagdishwar Sahay. 2006. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6
2. Ojha T.P. and A.M. Michael. 2018. Tenth edition. Principles of Agricultural Engineering, Vol – 1. Jain Brothers, New Delhi.

REFERENCES:

3. Donnell Hunt. 2013. Farm power and machinery management. Scientific International Pvt. Ltd. New Delhi.
4. Harris Pearson Smith et al. 1996. Farm machinery and equipments. Tata McGraw-Hill pub., New Delhi.
1. Kepner, R.A., R.Bainer, E.L. Barger. 2005. Third Edition. Principles of farm machinery. CBS Publishers and Distributors, Delhi.
2. Srivastava, A.C. 1990. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3			2	3						3	2	1	1
2	3			2	3						3	2	3	1
3	3		1	2	3						3	2	3	1
4	3		2	2	3						3	2	3	1
5	3	3	2	2	3						3	2	2	1
CO(W.A)	3	3	2	2	3						3	2	2	1



17AGC14 IRRIGATION AND DRAINAGE ENGINEERING				
		L	T	P
		3	0	0
PREREQUISITE : 17AGC10		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Students will be able to		
1.0	To understand the concept of soil-water relationship	1.1	Describe the soil-water relationship	
2.0	To acquire knowledge on water resources	2.1	Calculate the irrigation water requirement	
3.0	To understand the concept of irrigation methods	3.1	Select suitable irrigation methods for effective utilization of water resources	
4.0	To understand the concept and functioning of command area development programme	4.1	Implement new techniques for command area development	
5.0	To understand different agricultural drainage systems	5.1	Design suitable drainage system for effective crop production	

UNIT I –IRRIGATION SOURCES AND REQUIREMENTS	(9)
Surface and ground water resources – River basins- Irrigation- development and Utilization in India and Tamilnadu- Moisture use of crop- Evapotranspiration- ET-plot. Crop water Requirement – duty and delta- Effective rainfall- Scheduling- Irrigation Requirement- Irrigation Frequency, Irrigation Efficiencies.	
UNIT II – SOIL WATER TENSION AND MEASUREMENT OF SOIL WATER	(9)
Rooting characteristics – soil water tension and soil water stress – Soil water potential concept – total and gravitational potential – soil water retention – hydraulic conductivity – determination. Measurement of soil water-gravimetric, thermo-gravimetric – tensiometric, electrical resistance, pressure plate and pressure membrane apparatus methods – neutron scattering, immersion, dielectric, thermal conductivity, penetrometric and air permeability methods.	
UNIT III – METHODS OF IRRIGATION	(9)
Methods of Irrigation – Pressurized Irrigation- Hydraulics and design - Erodible and non-erodible, alluvial channels- Kennedy’s and Lacey’s theories, Materials for lining water courses and field channel, Water control and diversion structure - Underground pipeline irrigation system - Land grading - Land levelling methods.	
UNIT IV – COMMAND AREA DEVELOPMENT	(9)
Command area - Concept, Components of CADA - CADA programmes in Tamil Nadu - On Farm Development works, Execution - maintenance and economics of OFD WORKS, Farmer’s committee and its role for water distribution and system operation, Strategic outlet command – stream size for efficient warabandhi and rotational irrigation system.	

UNIT V - AGRICULTURAL DRAINAGE SYSTEMS	(9)
Agricultural drainage - Drainage coefficient, principles of flow through soils, Darcy's law – infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage - Pipe materials - mole drains, drainage wells, Leaching requirements - irrigation and drainage water quality - recycling of drainage water for irrigation.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. A.M. Michael. 2015. Second edition. Irrigation -Theory and Practice, Vikas publishing house, New Delhi. 2. V.V.N. Murthy. 2016. Sixth edition. Land and water management, Kalyani publishing, New Delhi. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Dilip Kumar Majumdar, Irrigation water Management-Principles and Practice, Prentice-Hall of India Pvt. 3Ltd, New Delhi, 2006. 2. J.N. Luthin, Drainage Engineering, John Wiley and Sons, New York, 1966. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	3	2	3			2			1		2	
2	3	2	3	2	3			2			1	2	3	1
3	3	2		1	3			2			2	2	2	2
4	3	1		1	1	3					3		2	2
5	3	1	3	2	3			2			2	2	3	2
CO(W.A)	3	2	3	2	3	3		2			2	2	2	2

M. Murthy

17AGC15 BIO AND THERMO- CHEMICAL CONVERSION OF BIOMASS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To understand the characters of biomass	1.1	Suggest suitable biomass conversion methods		
2.0	To impart knowledge on biochemical conversion of biomass	2.1	Suggest effective utilize the biochemical conversion		
3.0	To gain knowledge on thermochemical conversion by combustion	3.1	Effectively convert biomass for energy generation		
4.0	To know the importance of gasifiers and prylosis	4.1	Utilize the biomass for production for various end products		
5.0	To understand the importance of cogeneration and waste heat recovery	5.1	Suggest suitable methods for effective utilization of heat energy		

UNIT I - BIOMASS CHARACTERIZATION	(9)
Biomass – types – fuels from biomass. Terms and units used in biomass production. Biomass fuel characterization – physical, chemical and thermal – energy release. Supply chain – harvesting / collection– transportation and processing. Briquetting – types – pelletizing.	
UNIT II - BIOCHEMICAL CONVERSION	(9)
Biochemical degradation – factors affecting biogas production - types of biogas plants – construction details – operation and maintenance – utilization of biogas - slurry handling, utilization and enrichment – high rate biomethanation process – landfills – bioethanol – feedstock – process – utilization-- composting - methods – machinery.	
UNIT III - THERMO CHEMICAL CONVERSION BY COMBUSTION	(9)
Thermochemical degradation. Stoichiometric air requirement - Combustion process – chemistry of combustion - combustion zones – emissions. Co firing of biomass. Incinerators - layout. Combustion of wastes and MSW. Wood burning stoves – types – operation.	
UNIT IV - THERMOCHEMICAL CONVERSION BY GASIFICATION AND PYROLYSIS	(9)
Biomass gasification – chemistry of gasification – types of gasifier – Gas cleaning & conditioning - utilization of producer gas - emissions – commercial gasifies plants. Pyrolysis – product recovery – types – biochar – bio oil – operation – application.	
UNIT V - COGENERATION AND WASTE HEAT RECOVERY	(9)
Cogeneration technology – cycles – topping – bottoming – problems – applications – waste heat recovery. Carbon cycle - Carbon sequestration - CDM concept - CDM technologies - Carbon emission reduction calculation.	
TOTAL (L: 45) = 45 PERIODS	

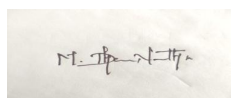
TEXT BOOKS:

1. Chakraverty, A. Biotechnology and other alternate technologies for utilisation of biomass, Oxford and IBH Publishing Co, New Delhi, 1993.
2. Chawla, O.P. Advances in Biogas Technology, ICAR Publication, New Delhi, 1986.
3. Nijaguna, B.T. Biogas Technology. New age international publishers. 2006.

REFERENCES:

1. Kothari, D.P., K.C.Singal and Rakesh Ranjan. 2008. Renewable energy sources and emerging technologies. Prentice Hall of India Pvt. Ltd., New Delhi – 01.
2. Myung Kyoon Lee, 2005. Baseline methodologies for clean development mechanism projects – A guide book – Vol. I. UNEP Publication.
3. Francis, D.K., Chingand and Ian M. Shapiro. 2004. Green Building. John Wiley and sons, Inc. New Jersey.
4. Sengio C. Capareda. 2014. Introduction to biomass energy conservations. CRC Press.

COURSE OUTCOME S	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	2	2		2	3					2		2
2	3	3	3	3		3	3		1		2	3	3	2
3	3	3	3	3		3			1		2	3	3	3
4	3	3	3	3		3	3		2		2	3	3	3
5	3	3	3	3	1	3	3		2		2	3	2	3
CO(W.A)	3	3	3	3	1	3	3		2		2	3	3	3



17AGP06 UNIT OPERATIONS IN AGRICULTURAL PROCESSING LABORATORY				
			L	T
			0	0
			P	C
			4	2
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Students will be able to		
1.0	To understand the working principles of various separators	1.1	Calculate and design various separators involved in agricultural processing operations	
2.0	To gain knowledge on size reduction equipment	2.1	Calculate energy requirement and select suitable size reduction equipment	
3.0	To know the importance of mixing in agricultural processing	3.1	Determine the mixing index	
4.0	To understand the evaporation methods for heat sensitive materials	4.1	Select and design suitable evaporators for concentration of heat sensitive materials	
5.0	To acquire the knowledge on various unit operations in sugar, solvent extraction industry	5.1	Design and minimize loss in agricultural processing units	

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Determination of separation efficiency of centrifugal separator 2. Determination of collection efficiency in cyclone separator 3. Performance evaluation of a sieve and determination of particle size of granular foods by sieve analysis 4. Determination of energy requirement in size reduction using the burr mill 5. Determination of energy requirement in size reduction using the ball mill 6. Determination of energy requirement in size reduction using the hammer mill 7. Determination of energy requirement in size reduction using the pin mill 8. Determination of thermal efficiency of open pan evaporator for concentration of juice 9. Visit to sugar industry 10. Visit to solvent extraction industry / flour mill
TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2											3
2	3	2	2											3
3	3	2	2											3
4	3	2	2											3
5	3	1	1	2				2	2	2	2			3
CO(W.A)	3	2	2	2				2	2	2	2			3

M. J. P. N. 17

17AGP07 IRRIGATION AND DRAINAGE ENGINEERING LABORATORY					
		L	T	P	C
		0	0	4	2
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To impart knowledge on various water resources	1.1	Effectively utilize the water resources		
2.0	To understand the methods for soil moisture content determination	2.1	Determine moisture content		
3.0	To know the estimation methods of water requirements	3.1	Minimize water loss		
4.0	To understand various irrigation system	4.1	Select and design suitable irrigation system		
5.0	To develop knowledge on micro irrigation system	5.1	Design micro irrigation system for effective utilization of available water resources		

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Study of River basins, irrigation projects, irrigation tanks and water resources in Tamil Nadu 2. Determination of soil moisture by different methods – gravimetric and tensiometer 3. Problems on duty of water – Duty and delta relationship 4. Estimation of water requirement by different methods 5. Estimation of Evapotranspiration 6. Determination of irrigation efficiencies and design of basin and furrow irrigation systems 7. Design of drip irrigation system 8. Design of sprinkler irrigation system 9. Design of underground pipeline system 10. Design of surface and sub-surface drainage systems
TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2				1	1				3	2	2	
2	2		2		3			2			2	1	2	
3	2	2	2	1	2						1		3	1
4	1					2		2			2	1	3	1
5	1		2	1	2	2		2			2	1	3	1
CO(W.A)	2	2	2	1	2	2	1	2			2	1	3	1

M. J. P. N. 17

17GED07- CONSTITUTION OF INDIA					
		L	T	P	C
		2	0	0	0
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The students will be able to		
1.0	To educate about the Constitutional Law of India	1.1	Gain Knowledge about the Constitutional Law of India		
2.0	To motivate students to Understand the Fundamental Rights and Duties of a citizen	2.1	Understand the Fundamental Rights and Duties of a citizen		
3.0	To make students to understand about Federal structure of Indian Government	3.1	Apply the concept of Federal structure of Indian Government		
4.0	To understand about Amendments and Emergency provisions in the Constitution	4.1	Analyze the Amendments and Emergency provisions in the Constitution		
5.0	To educate a holistic approach in their life as a Citizen of India	5.1	Develop a holistic approach in their life as a Citizen of India		

UNIT I – Introduction to Indian Constitution	(6)
Meaning of the constitution law and constitutionalism – Historical perspective of the Constitution – Salient features and characteristics of the Constitution of India	
UNIT II – Fundamental Rights	(6)
Scheme of the fundamental rights – Right to Equality – Fundamental Right under Article 19 – 102 Scope of the Right to Life and Liberty – Fundamental Duties and its legal status – Directive Principles of State Policy – Its importance and implementation	
UNIT III – Federal Structure	(6)
Federal structure and distribution of legislative and financial powers between the Union and the States – Parliamentary Form of Government in India – The constitutional powers and status of the President of India	
UNIT IV – Amendment to Constitution	(6)
Amendment of the Constitutional Powers and Procedure – The historical perspectives of the constitutional amendments in India	
UNIT V – Emergency Provisions	(6)
National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India	
TOTAL = 30 PERIODS	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						3		2				3		
2						2	3	2						
3						3	2	2						
4						3	3	3						
5						3		3				2		
CO(W.A)						3	3	2				3		

17AGC16 PLANT PROTECTION AND HARVESTING MACHINERY				
			L	T
			P	C
		3	0	0
		0	0	3
PREREQUISITE : 17AGC13		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Students will be able to		
1.0	To impart knowledge on interculture equipment	1.1	Select and design interculture equipment	
2.0	To study about types, parts and function of sprayers	2.1	Calculate the particle size and area covered by different sprayers	
3.0	To understand the duster application, care and maintenance	3.1	Maintain the duster for effective utilization	
4.0	To gain knowledge on working principle of various harvesting equipments.	4.1	Select suitable harvesting equipment	
5.0	To understand the construction and working of threshers and other machineries	5.1	Use fruit pluckers, tree shakers, post hole diggers and chaff cutter	

UNIT I - WEEDING EQUIPMENT	(9)
Weeding and Interculture equipment. Junior hoe - guntaka - blade harrow - dry land weeders - tractor mounted and engine operated sweeps. Engine operated and rotary weeders for upland and low land - selection, constructional features and adjustments.	
UNIT II – SPRAYERS	(9)
Sprayers – classifications - parts and accessories - atomizers - agitators - determination of particle size and distribution. Number Median Diameter (NMD) and Volume Median Diameter (VMD). Sprayer operation – boom sprayer - precaution - coverage - factors affecting drift. Rotating disc sprayers – Controlled Droplet Application (CDA) - Electrostatic sprayers - Aerial spraying.	
UNIT III – DUSTERS	(9)
Dusters - types - mist blower cum duster - other plant protection devices, care and maintenance.	
UNIT IV - HARVESTERS	(9)
Principles and types of cutting mechanisms. Harvesters - types - mower mechanism – construction and adjustments - registration and alignment. Mowers, windrowers, reapers, reaper binders and forage harvesters. Combine harvester – types - parts - construction and working. Diggers for potato, groundnut and other tubers. Sugarcane harvesters - cotton pickers - corn harvesters.	
UNIT V - THRESHERS AND OTHER MACHINERIES	(9)
Thresher – construction and working of multi crop thresher. Fruit pluckers - tree shakers - fruit harvesting machinery. Forest machinery - shrub cutters - tree cutting machines – post hole diggers – Chaff cutter.	
TOTAL (L: 45) = 45 PERIODS	

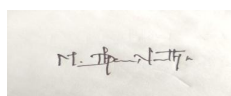
TEXT BOOKS:

1. Kepner, R.A., R.Bainer and E.L. Barger. 2005. Third Edition. Principles of farm machinery. CBS Publishers and Distributers, Delhi.
2. Donnell Hunt. 2013. Farm power and machinery management. Scientific International Pvt. Ltd. New Delhi.
3. Jagdishwar Sahay. 2006. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6
4. Srivastava, A.C. 1990. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi

REFERENCES:

1. Sanjay Kumar. 2013. Fundamentals of Agricultural Engineering. Kalyani publishers, Ludhiana - 141 008.
2. Surendar singh, 2011. Farm Machinery Principles and Applications. Indian Council of Agricultural Research, New Delhi-12.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3								3	
2	3	2	2	3	3	2	3	1					3	
3	3		1	2		2	3						3	
4	3	2	3	2	3	2		2				2		3
5	3	2	3	2	3	3	1	2				2		3
CO(W.A)	3	2	2	2	3	2	2	2				2	3	3



17AGC18 DESIGN OF MICRO IRRIGATION SYSTEM					
		L	T	P	C
		2	2	0	3
PREREQUISITE : 17AGC14		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Students will be able to			
1.0	To learn the various water lifting devices	1.1	Categorize the different types of pumps and water lifting devices		
2.0	To understand the types of valves	2.1	Differentiate, select and maintain pump valves		
3.0	Gain knowledge on traditional and micro irrigation methods and advantages	3.1	Imply modern irrigation concepts		
4.0	Acquire knowledge on components, design, operation and maintenance of drip irrigation system	4.1	Design drip irrigation system		
5.0	Acquire knowledge on components, design, operation and maintenance of sprinkler irrigation system	5.1	Design sprinkler irrigation system		

UNIT I - WATER LIFTS AND PUMPS	(6+6)
Pump classification Variable displacement pumps–Centrifugal pump- Submersible pump- Vertical Turbine pumps mixed flow – Jet and Airlift pumps-Pump selection and installation- Pump troubles and Remedies.	
UNIT II - PUMP VALVES	(6+6)
Types of valves- Pressure relief valve- Gate valve-Isolated valve- Non return valve- Butterfly valve-Solenoid valves- Automated control valve- selection, repair and maintenance.	
UNIT III - MICRO IRRIGATION CONCEPT AND APPLICATIONS	(6+6)
Micro irrigation- Comparison between Traditional and Micro irrigation methods -Merits and demerits of micro-irrigation system, Types and components of micro irrigation system- Scope and potential problem of micro irrigation - Low cost Micro irrigation Technologies- Gravity fed micro irrigation -Care and maintenance of micro-irrigation System- Economics of micro-irrigation system automation in micro-irrigation-Surge and cablegation irrigation- Greenhouse irrigation system- hydroponics- aeroponics- soilless cultivation	
UNIT IV - DRIP IRRIGATION DESIGN	(6+6)
Drip irrigation - Components- Dripper- types and equations governing flow through drippers-Wetting pattern- Chemigation application- Pump capacity-Installation- Operation and maintenance of Drip irrigation system. - Design of surface and sub-surface drip irrigation.	
UNIT V - SPRINKLER IRRIGATION DESIGN	(6+6)
Sprinkler irrigation- Components and accessories - Hydraulic design - Sprinkler selection and spacing- Capacity of sprinkler system - types - Sprinkler performance- Sprinkler discharge- Raingun and POP irrigation. Water distribution pattern- Droplet size, filtering unit, fertigation - System maintenance.	
TOTAL (L: 30+T:30) = 60 PERIODS	

TEXT BOOKS:

1. Suresh, R., "Principles of Micro-Irrigation Engineering", Standard Publishers Distributors, New Delhi, 2010.
2. Michael, A.M. 2015. Second Edition. Irrigation: Theory and Practices, Vikas Publishing House Pvt., Limited.

REFERENCES:

1. Modi, P.N., and Seth, S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 1991.
2. Jack Keller and Rond Belisher., "Sprinkler and Trickle Irrigation", Vannistr and Reinhold, New York, 1990.
3. Sivanappan R.K., "Sprinkler Irrigation", Oxford and IBH Publishing Co., New Delhi, 1987.
4. Keller.J and D. Karmeli, "Trickle Irrigation Design", Rainbird Sprinkler Irrigation Manufacturing Corporation, Glendora, California, USA.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	2	2	2	1	1					2	3	
2	3	3		1	2	2	1					2	3	
3	3	2	3	2	1	2	2					1	3	
4	2	2	3	3	2	1	1		1			1	3	
5	2	2	3	2	1	1	2		1			1	3	
CO(W.A)	2	2	3	2	2	1	1		1			1	3	

17AGP08 CAD FOR AGRICULTURAL ENGINEERING							
				L	T	P	C
				0	0	4	2
PREREQUISITE : NIL							
COURSE OBJECTIVES AND OUTCOMES:							
Course Objectives				Course Outcomes: The Students will be able to			
1.0	To develop software skills for drawing orthographic views			1.1	Draw orthographic views		
2.0	To understand the software tools usage			2.1	Draw two dimensional and three dimensional views of machine components		
3.0	To gain knowledge on different machine components			3.1	Design machine components		
4.0	To acquire knowledge on software available			4.1	Create three dimensional assembly model		
5.0	To develop drawing skills			5.1	Effectively utilize the software skills		

LIST OF EXPERIMENTS:	
<ol style="list-style-type: none"> 1. Create a orthographic views of machine components from isometric component drawing 2. Create a three dimensional model of spur gear 3. Create a three dimensional model of helical gear 4. Create a three dimensional assembly model of bolt and nut from detailed orthographic drawings 5. Create a three dimensional assembly model of bearing from detailed orthographic drawings 6. Create a three dimensional assembly model of coupling from detailed orthographic drawings 7. Create a three dimensional assembly model of IC engine components from detailed orthographic drawings 8. Create a three dimensional assembly model of valves from detailed orthographic drawings 9. Create a three dimensional assembly model of simple mechanism 10. Create a three dimensional assembly model of power transmission system 	
TOTAL (P: 60) = 60 PERIODS	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2		3	2	3	1							3	
2	2		3	2	3	1						3	3	
3	2		3	2	3	1						3	3	
4	2		3	2	3	1						3	3	
5	2		3	2	3	1						1	3	
CO(W.A)	2		3	2	3	1						3	3	

M. J. J. J. J.

17AGP09 DRAWING OF FARM STRUCTURES					
		L	T	P	C
		0	0	4	2
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Students will be able to		
1.0	To acquire know on farmstead, machine shed and workshop	1.1	Design farmstead, machine shed and workshop		
2.0	To acquire knowledge on dairy and poultry house	2.1	Design dairy and poultry house		
3.0	To understand the importance of ventilation system for dairy and poultry house	3.1	Design ventilation system for dairy and poultry house		
4.0	To study the different silo and storage structures	4.1	Design different storage structure for foods and silage		
5.0	To understand the importance of fencing and sanitary structure	5.1	Design fencing and sanitary structure		

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Planning and Layout of farmstead 2. Design of stall bam 3. Design of loose housing and milk parlors 4. Design of poultry house 5. Design of a sheep / goat house 6. Design of ventilation system for dairy and poultry house 7. Design of silos – over ground and underground and hay storages 8. Design of farm fencing system 9. Design of machinery and equipment shed and workshops 10. Design of septic tank and sanitary structures
TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3	3									3	
2	3		3	3									3	
3	3		3	3									3	2
4	3		3	2									3	3
5	3		3	2									3	
CO(W.A)	3		3	3									3	3



17GED08 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					
		L	T	P	C
		2	0	0	0
PREREQUISITE : Nil					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The students will be able to		
1.0	To Understand the basics of Indian tradition and Indian traditional knowledge systems	1.1	Gain Knowledge about of Indian tradition and Indian traditional knowledge systems		
2.0	To know about basics of technologies and its scientific perspectives.	2.1	Understand basics of technologies and its scientific perspectives.		
3.0	To study the basics of Indian traditional health care ,	3.1	Understand basics of Indian traditional health care		
4.0	To know the basics of Indian artistic tradition knowledge	4.1	Understand basics of Indian artistic tradition		
5.0	To develop the basics of linguistic tradition	5.1	Develop the basics of linguistic tradition		

UNIT I - Indian Tradition:	(6)
Fundamental unity of India, India's heroic role in world civilization, The Indian way of life, Introduction to Indian tradition, The Scientific Outlook and Human Values.	
UNIT II - Indian Knowledge System and Modern Science:	(6)
Relevance of Science and Spirituality, Science and Technology in Ancient India, Superior intelligence of Indian sages and scientists	
UNIT III - Indian Traditional Health Care:	(6)
Importance and Practice of Yoga, Pranayam and other prevailing health care techniques	
UNIT IV - Indian Artistic Tradition:	(6)
Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature etc	
UNIT V - Indian Linguistic Tradition:	(6)
Ancient Indian languages and literary Heritages, Phonology, Morphology, Syntax and Semantics	
TOTAL = 30 PERIODS	

TEXT BOOKS:
1. Sivaramakrishnan, V., Cultural Heritage of India- Course Material, Bharatiya Vidya Bhavan, Mumbai 5 th Edition, 2014
2. Swami Jitatmananda, Modern Physics and Vedanta, Bharatiya Vidya Bhavan, 2004.
3. Raman V.V., Glimpses of Indian Heritage, Popular Prakashan,1993
4. Jha V.N., Language, Thought and Reality
5. Krishna Chaitanya, Arts of India, Abhinav Publications, 1987

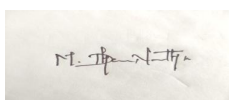
COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3					3		2						
2	3					2								
3	3					2						1		
4	3					2						3		
5	3					3		3						
CO(W.A)	3					2		3				2		

M. J. P. N. P.

17GED06 COMPREHENSION					
		L	T	P	C
		0	0	2	0
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E. Degree course through periodic exercise.	1.1	Understand and comprehend any given problem related to Agriculture Engineering field.		

METHOD OF EVALUATION	
<p>The student will be assessed for his understanding of the basic principles of the core engineering subjects. The internal assessment for a total of 50 marks will be evaluated by a committee comprising of the faculty members of the department. The committee will conduct two assessments of objective question type from the subjects as follows</p> <ul style="list-style-type: none"> • Test 1 - Fluid Mechanics, Crop Process Engineering, Farm Tractor Systems, Hydrology and Water Resources, Crop production. • Test 2 - Heat and Mass Transfer, Unit operation, Irrigation systems- Pumps and motors, Micro irrigation, Thermodynamics, Refrigeration and air-conditioning. <p>The end semester examination, which carries a total of 50 marks, will be an objective question type examination conducted by a committee of one internal examiner appointed by the COE of our college.</p>	
TOTAL (P: 30) = 30 PERIODS	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2		3		2	3				2		
CO(W.A)	3	3	2		3		2	3				2		

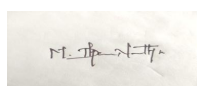


17AGC19 FOOD AND DAIRY ENGINEERING				
		L	T	P
		3	0	0
PREREQUISITE : 17AGC12		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To understand the basic concepts and methods of food concentration	1.1	Explain the different food concentration methods	
2.0	To understand the importance of thermal processing in food processing	2.1	Apply thermal processing technique to improve shelf life of foods	
3.0	To acquire knowledge on drying and dehydration	3.1	Apply suitable drying and dehydration methods to minimize food loss	
4.0	To know the importance and properties of milk	4.1	Assess the suitable preservation technique for milk	
5.0	To gain knowledge on working principle and value products of milk	5.1	Test milk and produce value added products from milk	

UNIT I – METHODS OF CONCENTRATION OF FOOD MATERIALS	(9)
Constituents of food and their energy values – Engineering properties of food materials – Physical, mechanical, thermal, rheological, electrical and physico-chemical properties of food materials – texture of food materials – definition – Terminologies – viscometry – basic concepts – Concentrations of foods – freeze concentration – membrane concentration	
UNIT II – THERMAL PROCESSING OF FOODS	(9)
Thermal processing of foods – product-time-temperature relationships – cooking, blanching – pasteurization techniques – UHT Processing – sterilization of solid and liquid foods - interaction of heat energy on food components – kinetics of microbial destruction – Decimal reduction time – Temperature dependence of kinetics – Arrhenius equation – Thermal Death Time Curves – loss of nutrient in Newtonian and non-Newtonian liquid foods – batch and continuous sterilization equipment. Preservation by irradiation – retort processing – principles and applications – microwave and radio frequency heating in food processing – Canning.	
UNIT III – DRYING AND DEHYDRATION	(9)
Food spoilage – causes for spoilage – Moisture content – free moisture – bound and unbound moisture – equilibrium moisture content – Water activity – sorption behaviour of foods – dehydration – methods of dehydration – types of dryers – tray, tunnel, drum, spray, dryers-advantages and disadvantages – osmotic dehydration – microwave drying – foam mat drying of materials – freeze drying.	
UNIT IV – MILK PROCESSING	(9)
Physical, chemical, thermal and rheological properties of milk – storage tanks. Receiving handling and testing of milk – storage. Pasteurization – principles and methods – equipment – Low Temperature Long Time – High Temperature Short Time – Ultra High Temperature 2pasteurization.	

UNIT V - DAIRY EQUIPMENT AND PRODUCTS	(9)
Homogenisation - theory and working of homogenisers – high pressure homogenization of milk and other food suspensions – design criteria for homogenizing equipment- cream separation - principles - types of separators. Clarifiers - butter churns – ghee manufacture - equipment – whey manufacture – techniques – equipment – ice cream freezers – condensed milk – milk powder manufacturing – drying equipment - drum drier and spray drier - milk products – paneer – casein – probiotic dairy products – milk plant sanitation requirements - Cleaning in-place and its functions.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. R.Paul Singh and R.Dennis Heldman, Introduction to Food Engineering. Third Edition, Academic Press, London, 2004. 2. H.G.Kessler, Food Engineering and Dairy Technology, Freising, Germany, Verlag A. Kessler, 1981. 3. Norman N. Potter and Joseph H. Hotchkiss, Food Science, Fifth Edition, Food Science Text Series, 3. ISBN: 978-1-4613-7263-9 (Print) 978-1-4615-4985-7 (Online), 1995 4. R.M. Teledo, Fundamentals of Food Process Engineering, 2nd Ed. Van Nostrand Reinhold, New York, 1991. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. C.W. Hall and T.J. Hedrick, Drying of milk and milk products, AVI Publishing Co., West Port, Connecticut, USA, 1971. 2. Ahmed, Tufail "Dairy Plant Engineering and Management", Kitab Mahal, Allahabad, 1997. 3. P. T. Walstra, J. Geurts, A. Nooman, A. Jellema and M.A. J.S Van Boekel, Dairy Technology, Marcel Dekker Inc. New York, 2005. 4. S.E.Charm, The fundamentals of Food engineering, AVI Pub.Co., Inc, 1971. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3					2								2
2	3	2	1	3	2	3						3	1	3
3	3	3	2	2	1	2							2	3
4	3	3	2	3	2	3						3	2	3
5	3				3	3							1	2
CO(W.A)	3	3	2	3	2	3						3	2	3



17AGC20 TESTING AND MANAGEMENT OF FARM MACHINERY					
		L	T	P	C
		3	0	0	3
PREREQUISITE : 17AGC13		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To understand the different constrains involved in field machinery system	1.1	Manage the constrains involved in field machinery system		
2.0	To gain knowledge on testing and evaluation of tractor	2.1	Analyze the performance of tractor		
3.0	To gain knowledge on testing and evaluation of power tiller	3.1	Analyze the performance of power tiller		
4.0	To understand the testing and evaluation of tillage and sowing equipment	4.1	Test and evaluate tillage and sowing equipment		
5.0	To understand the testing and evaluation of plant protection and harvesting machinery	5.1	Test and evaluate plant protection and harvesting machinery		

UNIT I – MANAGEMENT OF MACHINERY	(9)
Field machinery system – Importance of farm machinery management- field Performance and Power requirements. Cost of operation - Machinery for operator comfort and safety.	
UNIT II – TRACTOR	(9)
Testing and evaluation systems in India – General Guidelines on the use of test codes. Testing and Evaluation of agricultural tractors – Indian standards. Performance of agricultural tractors – analysis of results – Nebraska tractor test and test reports.	
UNIT III - POWER TILLER AND IMPLEMENTS	(9)
Testing and evaluation of power tiller. Testing and evaluation of tillage implements- Mould board – rotovator.	
UNIT IV - TILLAGE AND SOWING EQUIPMENT	(9)
Testing and evaluation of Tillage machinery - seed cum fertilizer drill – weeders - Rice transplanter.	
UNIT V - PLANT PROTECTION AND HARVESTING MACHINERY	(9)
Testing and evaluation of manually operated sprayer and duster - Combine harvester - thresher.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Metha M.L., SR.Verma, K Mishra and V.K. Sharma. 1995. Testing and Evaluation of Agricultural Machinery, National Agricultural Technology Information Centre, Ludhiana-141001.
2. RNAM test codes and procedure for farm machinery, 1983
3. Donnell Hunt. 2013. Farm power and machinery management. Scientific International Pvt. Ltd. New Delhi.
4. Indian standard test codes related to tractors, power tillers and agricultural implements.

REFERENCES:

1. Liljedahl, J.B., P.K. Turnquist, D.W.Smith and M.Hoki. 2004. Fourth Edition. Tractors and their power units. CBS Publishers and Distributers, Delhi.
2. Kepner, R.A., R.Bainer, E.L. Barger. 2005. Third Edition. Principles of farm machinery. CBS Publishers and Distributers, Delhi.
3. Claude Culpin (198) Profitable farm mechanization Crosby Lockwood & Sons Ltd., 26, Old Brompton Road, SW.7
4. Donnell R. Hunt 1986. Engineering models for Agricultural production. The AVI publishing co.INC, Connecticut-06881.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3					3	3	3			2	
2	3	3	3	3	2			3	2			2	3	2
3	3	3	3	3	3			1				2	2	3
4	3	3	3	3	3			1				2		
5	3	3	3	3	3			1				2	2	
CO(W.A)	3	3	3	3	3			2	3	3		2	2	3

17AGC21 REMOTE SENSING AND GIS FOR AGRICULTURAL ENGINEERS				
		L	T	P
		2	0	2
PREREQUISITE : 17AGC04		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To understand the fundamentals of remote sensing	1.1	Describe the basics of remote sensing	
2.0	To gain knowledge on types, applications of remote sensing satellites and sensors	2.1	Explain the role of remote sensing satellite and sensors	
3.0	To understand the digital image processing	3.1	Discuss the concepts of GIS and coordinate system	
4.0	To understand the basic concepts and types of GIS	4.1	Interpret the spatial images of vegetation, soil, water	
5.0	To know the application of GIS	5.1	Explain the application of GIS in different sectors	

UNIT I - REMOTE SENSING	(6)
Introduction-Fundamentals of Remote Sensing-Definition, Advantages-Components- Physics of Remote Sensing-Electro Magnetic Spectrum (EMR)-Radiation laws – Wave theory-Stefan-Boltzmann Laws-Interaction of EMR with Atmosphere- Scattering-Rayleigh, Mie and Non-Selective scattering-Absorption-Atmospheric windows-interaction of EMR with Earth objects-Spectral signature-Spectral reflectance characteristics of vegetation, soil and water	
UNIT II - REMOTE SENSING SATELLITES AND SENSORS	(6)
Platforms-Types-Applications – Sun synchronous and geo synchronous orbits-Active and Passive sensors-Resolution-Spatial, Spectral, Radiometric and Temporal, significance of Resolution-Satellites and Sensors- LANDSAT, SPOT, IRS, RESOURCESAT, CARTOSAT, LISS Images, Thematic Mapper-High Resolution commercial satellites-METEOSAT,NOAA-ERS, RADARSAT.	
UNIT III – GEOGRAPHICAL INFORMATION SYSTEM	(6)
Definition- Concept of GIS - Maps and their influences- Characteristics of Maps- Elements - Projection-Coordinate system- sources of spatial data- History and development of GIS	
UNIT IV – DATA INPUT AND ANALYSIS	(6)
Data- spatial, Non spatial- Hierarchical Network- Data types- Raster and vector –files and their organization. Methods of Data input – Data Editing, Data structure- Database Management – digitizer – reclassification – spatial analysis – buffering – map –overlay – interpolation – Digital Elevation Model- Output data – devices for output.	
UNIT V - GIS APPLICATIONS	(6)
Land and Water resources Management-Agriculture-Surface and Ground water hydrology-Soil erosion assessment-Pollution abatement-Earth sciences-watershed management.	

Practical

1. Measurement of relief displacement using parallex bar
2. Stereoscopic vision test – Visual
3. Aerial Photo interpretation – visual
4. Satellite images interpretation – Visual
5. Database Management systems
6. Spatial data input and editing – Digitizing
7. Raster analysis problem – Database query
8. GIS application in watershed analysis
9. GIS application in rainfall – runoff modeling
10. GIS application in Soil erosion modelling

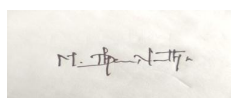
Total (L:30+P:30)=60 Periods**TEXT BOOKS:**

1. M.Anji Reddy, Textbook of Remote Sensing and Geographical Information System, 3rd Edition, BS Publications, 2008.
2. Floyd F.Sabins, Remote Sensing: Principles and Interpretation, III edition, Freeman and Company, New York, 1997.

REFERENCES:

1. Ian Heywood, An Introduction to GIS, Pearson Education, New Delhi, 2001.
2. P.A. Burrough, Principle of GIS for land resources assessment, Oxford Publications, 1990.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3					2	3		3				2	2
2	3					3	2		3			3	2	2
3	3				3				3				2	
4	3	2	1	2	3				3			3	2	1
5	3	3	3	3	3	3	3		3			3	1	
CO(W.A)	3	3	2	3	3	3	3		3			3	2	2



17AGC17 PROTECTED CULTIVATION				
			L	T
			3	0
PREREQUISITE : 17AGC01		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To impart knowledge on protected cultivation and its types	1.1	Differentiate protected cultivation methods and imply in crop production	
2.0	To acquire knowledge on hi-tech cultivation techniques for vegetable crops	2.1	Apply hi-tech techniques for effective production for vegetable crops	
3.0	To acquire knowledge on hi-tech cultivation for flower crops	3.1	Apply hi-tech techniques for effective production for flower crops	
4.0	To develop skills in precision farming techniques	4.1	Apply precision farming techniques for effective production	
5.0	To learn and practice the various production practices for cut flowers and other high value crops	5.1	Assesses the technology for horticulture crops	

UNIT I – PROTECTED CULTIVATION AND ITS TYPES	(9)
Importance and methods of protected culture in horticultural crops. Importance and scope of protected cultivation, different growing structures of protected culture viz., green house, poly house, net house, poly tunnels, screen house, protected nursery house. Study of environmental factors influencing green house production, cladding / glazing / covering material, ventilation systems, cultivation systems including nutrient film technique / hydroponics / aeroponic culture, growing media and nutrients, canopy management, micro irrigation and fertigation systems.	
UNIT II – PROTECTED CULTIVATION OF VEGETABLE CROPS	(9)
Protected cultivation technology for vegetable crops: Hi-tech protected cultivation techniques for tomato, capsicum nursery, cucumber, gherkins, strawberry and melons, integrated pest and disease management, postharvest handling.	
UNIT III – PROTECTED CULTIVATION OF FLOWER CROPS	(9)
Protected cultivation technology for flower crops: Hi-tech protected cultivation of cut roses, cut chrysanthemum, carnation, gerbera, Asiatic lilies, anthurium, orchids, cut foliage and fillers, integrated pest and disease management, postharvest handling.	
UNIT IV –PRECISION FARMING TECHNIQUES	(9)
Concept and introduction of precision horticulture: importance, definition, principles and concepts. Role of GIS and GPS. Mobile mapping system and its application in precision farming. Design, layout and installation of drip and fertigation in horticultural crops, role of commuters in developing comprehensive systems needed in site specific management (SSM), georeferencing and photometric correction. Sensors for information gathering, geostatistics, robotics in horticulture, postharvest process management (PPM), remote sensing, information and data management and crop growth models, GIS based modeling.	

UNIT V - PRECISION FARMING OF HORTICULTURAL CROPS	(9)
Precision farming techniques for horticultural crops: Precision farming techniques for tomato, chilli, bhendi, bitter gourd, bottle gourd, cauliflower, cabbage, grapes, banana, rose, jasmine, chrysanthemum, marigold, tuberose, china aster, turmeric, coriander, coleus and gloriosa.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> Lyn.Malone, Anita M.Palmer, Chrisitne L. Vloghat Jach Dangeermond. Mapping out world: GIS lessons for Education, ESRI press, 2002. David Reed, Water, media and nutrition for green house crops. Ball publishing USA, 1996. Adams, C.R., K.M.Bandford and M.P.Early, Principles of Horticulture, CBS publishers and distributors, Darya ganj, New Delhi, 1996. 	
REFERENCES:	
<ol style="list-style-type: none"> H.Panda, Essential oils – Handbook, National Institute of Industrial Research, ISBN, New Delhi, 2000. Anonymous, Handbook of oils, fats and derivatives with refining and packaging technology, Engineers India Research Institute, New Delhi, 2004. T.P. Hilditch, Industrial chemistry of the fats and waxes, Bailliere, Tindall and Co Publishers, London, 1943. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	3	3	3	2	2		2		2	2	3	1
2	2	1		1	3	2	2				2	1	3	
3	2	1		1	3	2	2				2	1	3	
4	3	3	3	3	3	2	2		2		2	3	3	1
5	2	1		1	3	2	2				2	1	1	
CO(W.A)	2	2	3	2	3	2	2		2		2	2	3	1

17AGP10 FOOD AND DAIRY ENGINEERING LABORATORY				
			L	T
			0	0
			P	C
			4	2
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To know the microbial determination in food materials	1.1	Detect the type and concentration of microbial load	
2.0	To understand working of different dryers	2.1	Select and design suitable dryers for agricultural produce	
3.0	To acquire knowledge on dehydration and rehydration ratio	3.1	Produce value added products of fruits	
4.0	To know the importance and properties of milk	4.1	Assess the suitable preservation technique for milk	
5.0	To gain knowledge on working principle and value products of milk	5.1	Test milk and produce value added products from milk	

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Estimation of microbial load in food materials 2. Determination of water activity 3. Analysis of adulteration in foods 4. Determination of drying rate in tray dryer 5. Determination of drying rate of foam mat dryer 6. Experiment on microwave oven heating of food 7. Experiment on osmotic dehydration of foods 8. Determination of rehydration ratio of dehydrated foods 9. Determination of properties of milk 10. Determination of separation efficiency of cream separator 11. Visit to a dairy industry
TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3		2	3			3	3				
2	3	3	3		2	3			3	3			2	
3	3	3	3		2	3			3	3			2	
4	3	3	3		2	3			3	3				
5	3	3	3		2	3			3	3			2	
CO(W.A)	3	3	3		2	3			3	3			2	

17AGP11 OPERATION AND MAINTENANCE OF FARM MACHINERY LABORATORY				
			L	T
			P	C
		0	0	4 2
PREREQUISITE : 17AGC05				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To understand the tractor system	1.1	Identify the major tractor system	
2.0	To impart knowledge on hitching and operating of implements with the tractor	2.1	Hitch and operate farm implements with the tractor	
3.0	To understand the periodical maintenance of various farm implements and equipment	3.1	Implement various maintenance techniques for various farm implements and equipment	
4.0	To understand the operating mechanism of seed drill with tractor	4.1	Operate, adjust seed drill with tractor	
5.0	To study the trouble shooting and remedies in tractor	5.1	Take remedial action for maintenance for tractor	

LIST OF EXPERIMENTS:
<ol style="list-style-type: none"> 1. Identification of major systems of a tractor and general guidelines and preliminary check measures 2. Practice in hitching and operating the mould board plough with the tractor – operational adjustments, maintenance and safety aspects 3. Practice in hitching and operating the disc plough with the tractor – operational adjustments, maintenance and safety aspects 4. Practice in hitching and operating the rotovator with the tractor – operational adjustments, maintenance and safety aspects 5. Practice in hitching and operating cultivator with tractor – operational adjustments, maintenance and safety aspects 6. Study on periodical maintenance – maintenance and safety aspects for various tillage implements and sowing equipment attached to the tractor and weeding equipment 7. Practice in operating seed drill with tractor – operational adjustments, maintenance and safety aspects 8. Practice in operating trailer with tractor – operational adjustments, maintenance and safety aspects 9. Study on the trouble shooting and remedies in tractor 10. Study on periodical maintenance aspects of tractor including tyre and battery
TOTAL (P: 60) = 60 PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	1	2		3	2	2	2	2		2	3	3
2	3	3	2	2		3	1	1	2			2	3	2
3	3	2	2	2		3	1	1	2			2	3	3
4	3	3	2	2		3	1	1	2			2	2	3
5	3	1	2	3		3	2	1	2	2		2	3	3
CO(W.A)	3	2	2	2		3	1	1	2	2		2	3	3

M. J. P. N. T. P.

17AGP12– Industrial Training (4 weeks)						
			L	T	P	C
			0	0	2	1
PREREQUISITE : NIL						
COURSE OBJECTIVES AND OUTCOMES:						
Course Objectives			Course Outcomes: The Student will be able to			
1.0	To train the students in field work so as to have a firsthand knowledge of practical problems in carrying out engineering tasks.		1.1	Better experience in practical knowledge at farm level.		
2.0	To develop skills in facing and solving the field problems.		2.1	Implement and rectify the problems of implements/ equipments at field level.		

STRATEGY:
The students individually under take training in reputed agriculture engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva voce examination by a team of internal staff
EVALUATION PROCEDURE
The industrial training shall carry 100 marks and shall be evaluated through internal assessment. The method of evaluation will be as follows : 1. Evaluation of industrial training report : 50 marks (Evaluated by the internal examiner) 2. Power point presentation : 50 marks (Evaluated by the internal examiner appointed by the HoD)
TOTAL (L: 30) = 30PERIODS

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1				3				3		3	3	3	3	
2				3				3		3	3	3	3	
CO(W.A)				3				3		3	3	3	3	



17AGD01 – PROJECT WORK-I				
		L	T	P
		0	0	8
PREREQUISITE : NIL			QUESTION PATTERN : TYPE -NIL	
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To practice the fundamental Agriculture Engineering concepts and principles in addressing a real time situation autonomously or in a team.	1.1	Study problems in the field of agriculture engineering through literature survey and its reviews.	
2.0	To develop an ability to solve problem by making a literature review and finding a solution for the same.	2.1	Undertake problem identification, formulation and solution	
3.0	To Study various types of methodology based on the problem.	3.1	Design engineering solutions to complex problems utilising a systems approach and develop projects	
4.0	To create platform to communicate and present the ideas in written and oral form	4.1	Communicate effectively and to present ideas clearly	
5.0	To create a team work to exhibit the knowledge and skills to contribute to the society.	5.1	Demonstrate the knowledge, skills and work as a team to achieve common goal	
DESCRIPTION				
<p>Project work may be allotted to a single student or to a group of students not exceeding 4 per group. The title of project work is approved by head of the department under the guidance of a faculty member and student(s) shall prepare a comprehensive project report after completing the work to the satisfaction of the guide. The Head of the department shall constitute a review committee for project work. There shall be three reviews during the semester by the committee to review the progress. Student(s) shall make presentation on the progress made by him / her / them before the committee and evaluation is done as per Rules and Regulations.</p>				
TOTAL (P: 120) = 120 PERIODS				

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3				2			3	3		1	3		2
2	3	3		2	2	3	3	2	3		3	2	2	1
3	3	3	3	3	2	3	3	3	3		3	2	3	3
4	3				2			2	3	3	1	1		
5	3				2	3	3	1	3	3	3	3		2
CO(W.A)	3	3	3	3	2	3	3	2	3	3	2	2	3	2

M. J. P. N. T. T.

17AGD02 – PROJECT WORK-II				
			L	T
			0	0
			P	C
			16	8
PREREQUISITE: 17AGD01		QUESTION PATTERN : TYPE -NIL		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To practice the fundamental Agriculture Engineering concepts and principles in addressing a real time situation autonomously or in a team.	1.1	Study problems in the field of Agriculture Engineering through literature survey and its reviews.	
2.0	To develop an ability to solve problem by making a literature review and finding a solution for the same.	2.1	Undertake problem identification, formulation and solution.	
3.0	To Study various types of methodology based on the problem.	3.1	Design engineering solutions to complex problems utilising a systems approach and develop projects	
4.0	To create platform to communicate and present the ideas in written and oral form	4.1	Communicate effectively and to present ideas clearly	
5.0	To create a team work to exhibit the knowledge and skills to contribute to the society.	5.1	Demonstrate the knowledge, skills and work as a team to achieve common goal	
DESCRIPTION				
<p>Project work may be allotted to a single student or to a group of students not exceeding 4 per group. The title of project work (same title as in project work-I if the same project is continued in project work-II or the title will be selected based on different project) is approved by head of the department under the guidance of a faculty member and student(s) shall prepare a comprehensive project report after completing the work to the satisfaction of the guide. The Head of the department shall constitute a review committee for project work. There shall be three reviews during the semester by the committee to review the progress. Student(s) shall make presentation on the progress made by him / her / them before the committee and evaluation is done as per Rules and Regulations.</p>				
TOTAL (P: 240) = 240 PERIODS				

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3				2			3	3		1	3		2
2	3	3		2	2	3	3	2	3		3	2	2	1
3	3	3	3	3	2	3	3	3	3		3	2	3	3
4	3				2			2	3	3	1	1		
5	3				2	3	3	1	3	3	3	3		2
CO(W.A)	3	3	3	3	2	3	3	2	3	3	2	2	3	2

M. P. N. N.

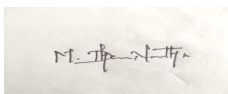
17AGX01 DESIGN OF AGRICULTURAL MACHINERY (Use of Approved Design data book is permitted)					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL			QUESTION PATTERN: TYPE – IV		
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To understand the stress involved in machine members	1.1	Calculate the stress involved in machine members		
2.0	To gain knowledge on power transmission systems	2.1	Design power transmission systems		
3.0	To gain knowledge on shafts and couplings	3.1	Design shafts and couplings		
4.0	To impart knowledge on energy storing elements	4.1	Design various energy storing elements		
5.0	To impart knowledge on gears	5.1	Design gears		

UNIT I - STRESSES IN MACHINE MEMBERS	(9)
Procedure in design process - factors influencing machine design - selection of materials based on mechanical properties preferred numbers ,fits and tolerance - direct, bending and torsional stress equation - Modes of failure- bending stress in curved beams - crane hook and 'C' frame - factor of safety.	
UNIT II - DESIGN OF POWER TRANSMISSION SYSTEMS	(9)
Selection of V-Belts and pulleys - selection of flat belts and pulleys - selection of transmission chains and sprockets.	
UNIT III - DESIGN OF SHAFTS AND COUPLINGS	(9)
Design of solid and hollow shafts based on strength and rigidity - Design of keys and keyways - Couplings - types - design of muff coupling, unprotected type flange coupling, bushed pin flexible coupling.	
UNIT IV - DESIGN OF ENERGY STORING ELEMENTS	(9)
Springs- types, helical springs, materials, end connections, terms used in compression springs - stresses and deflection in helical springs of circular wire - surge in springs - design of leaf springs	
UNIT V - DESIGN OF GEARS	(9)
Gears - spur gear and helical gear - terminology - strength of gear teeth - Lewis equation - Buckingham equation.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Bhandari, V. B. Design of Machine Elements, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2010 2. Shigley J. E. and Mischke, C. R., Mechanical Engineering Design, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2011 	

REFERENCES:

1. Khurmi.R.S and Gupta.J.K, "A Textbook of Machine Design", S.Chand and Company Ltd., New Delhi, 2014
2. Jalaludeen S.Md, "Machine Design (Volume-1)", 4th ed., Anuradha Publications, Chennai, 2011
3. Sundararajamoorthy T. V. Shanmugam. N, "Machine Design", Anuradha Publications, Chennai, 2003
4. Robert C. Juvinall, Kurt M. Marshek, "Machine Component Design", Wiley India Pvt Ltd., 2016
5. Ganesh Babu.K, Srithar.K, "Design of Machine Elements", 2nd ed., McGraw Hill Education (India) Private Limited, 2009

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	1	2	1							2	3	2
2	3	3	3	2	2							2	3	2
3	3	3	3	2	2							3	3	2
4	3	3	3	2	3							3	3	2
5	3	3	3	2	3							3	3	2
CO(W.A)	3	3	3	2	2							3	3	2



17AGX02 AGRICULTURAL BUSINESS MANAGEMENT				
			L	T
			P	C
			3	0
			0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To study the basic concept of agricultural business	1.1	Describe the concept of agricultural business	
2.0	To study the principle and management approaches of agri-business organization	2.1	Assess the management technique in agri-business	
3.0	To understand the functions and planning of agricultural marketing	3.1	Plan and estimate agricultural product marketing	
4.0	To acquire knowledge on agricultural business finance	4.1	Plan agri-business project	
5.0	To gain skills in market promotion and human resources	5.1	Apply the skills for effective marketing by utilization of human resources	

UNIT I - CONCEPTS OF AGRICULTURAL BUSINESS	(9)
Agri-business – scope, characteristics, types. Management - importance, definition, management and administration, management thoughts, Small business – characteristics and stages of growth – Management functions – planning, organizing, leading.	
UNIT II - AGRI – BUSINESS ORGANIZATION	(9)
Principles, forms of agri-business organizations, staffing, directing, supervision and motivation. Controlling – types, performance evaluation and control techniques. Management approaches - Profit Centered Approach, Management by objectives and Quality Circles. Strength, Weakness, Opportunities and Threat (SWOT) Analysis.	
UNIT III - AGRICULTURAL MARKETING	(9)
Functional areas of Agri-business – Production and Operations management – functions, planning physical facilities and managing quality. Agro-inputs and products inventory management – raw material procurement, inventory types, and costs. Marketing management – Marketing environment, marketing mix – Agricultural input marketing firms.	
UNIT IV - AGRICULTURAL BUSINESS FINANCE	(9)
Forms of agri-business organizations – Role of lead bank in agribusiness finance – Financial management. Acquiring capital – Budget analysis. Concepts and determinants – Business project scheduling of raw material procurement – production management – launching products (branding, placement) – Input marketing promotion activities.	
UNIT V - MARKET PROMOTION AND HUMAN RESOURCES	(9)
Agricultural products – marketing promotion activities – product pricing methods. District Industries Centre – Consumer survey – Agricultural inputs retailing – Market potential assessment – types of distribution channels - Return on Investment – Personnel management. Recruitment, selection and training – Technology in Agri-business.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Himanshu, "Agri Business Management – Problems and prospects", Ritu Publications, Jaipur, 2005.
2. Smita Diwase, "Indian Agriculture and Agribusiness Management", Krishi resource Management Network, Pune 2004.

REFERENCES:

1. Chandra Prasanna, "Projects: Preparation, Appraisal, Budgeting and Implementation", Tata McGraw Hill Publications, New Delhi, 2001.
2. Kotler, P., "Marketing Management. Analysis, Planning and Control", Prentice Hall Inc., New York, 2001.
3. Rao, V.S.P., and Narayana, P.S., "Principles and Practices of Management", Konark Publishing Private Limited, New Delhi, 2001.
4. Tripathy, P.C., and Reddy, P.N., "Principles of Management", Tata McGraw Hill Publications, New Delhi, 2000.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1						2		3			3	2		
2		2		2	2	1		3		2	2	3		
3		2	2	2	2	2		3		2	3	3		
4		2	2	2	2	2		3			3	3		
5		1	2	2	3	2		3		2	3	3		
CO(W.A)		2	2	2	2	2		3		2	3	3		

17AGX03 SYSTEMS ANALYSIS AND SOFT COMPUTING IN AGRICULTURAL ENGINEERING				
			L	T
			3	0
			P	C
			0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To understand the basic concept of system engineering	1.1	Apply system approach for water resources and irrigation	
2.0	To impart knowledge on linear programming and dynamic programming	2.1	Apply linear programme techniques in agricultural operations	
3.0	To understand the basic principle and concept of simulation	3.1	Apply simulation technique in irrigation scheduling	
4.0	To gain knowledge on neural network	4.1	Apply neural network in agricultural operations	
5.0	To understand basic concepts and properties of fuzzy logic	5.1	Apply fuzzy logic in agricultural operations	

UNIT I - SYSTEM CONCEPTS	(9)
Definition, classification, and characteristics of systems – Scope and steps in systems engineering – Need for systems approach to water resources and irrigation.	
UNIT II - LINEAR PROGRAMMING & DYNAMIC PROGRAMMING	(9)
Introduction to operations research – Linear programming, problem formulation, graphical solution, solution by simplex method – Sensitivity analysis – application – Bellman’s optimality criteria, problem formulation and solutions – application.	
UNIT III – SIMULATION	(9)
Basic principles and concepts – Random variate and random process – Monte Carlo techniques – Model development – Inputs and outputs – Deterministic and stochastic simulation – Irrigation Scheduling - application.	
UNIT IV - NEURAL NETWORKS	(9)
Neuron, Nerve structure and synapse, Artificial Neuron and its model, Neural network architecture: networks, Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory- Architecture: model, solution, single layer and multilayer perception model; back propagation learning methods, applications.	
UNIT V - FUZZY LOGIC AND GENETIC ALGORITHM	(9)
Basic concepts of fuzzy logic, Fuzzy set theory and operations, Properties of fuzzy sets, Membership functions, interference in fuzzy logic, Fuzzy implications and Fuzzy algorithms, Fuzzy Controller, Industrial applications.	
Genetic Algorithm (GA) - Basic concepts, working principle, procedures, flow chart, Genetic representations, encoding, Initialization and selection, Genetic operators, Mutation – applications	
TOTAL (L: 45) = 45 PERIODS	

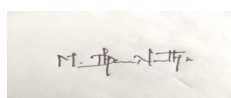
TEXT BOOKS:

1. Vedula, S., and Majumdar, P.P. Water Resources Systems – Modeling Techniques and Analysis Tata McGraw Hill, New Delhi, Fifth reprint, 2010.
2. Robert M Peart and W David Shoup, Agricultural Systems Management – Optimizing efficiency and performance, CRC Press, 2013.
3. Gupta, P.K., and Man Mohan, “Problems in Operations Research”, (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.

REFERENCES:

1. Chaturvedi, M.C., “Water Resources Systems Planning and Management”, Tata McGraw Hill, New Delhi, 1997.
2. Taha, H.A., “Operations Research”, McMillan Publication Co., New York, 1995.
3. Hiller, F.S., and Liebermann, G.J., “Operations Research”, CBS Publications and distributions, New Delhi, 1992.
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.
5. Rajsekaran, S. & Vijayalakshmi Pai, G.A., “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3	3	3	2			2	2	2	
2	3	3	3	3	2			3	2			2	2	
3	3	3	3	2	3		2		2		2	2	3	
4	3	2	2	2	2			2			2	3	2	
5	3	2	2	2	3			3			3	2	2	
CO(W.A)	3	3	3	2	3	3	3	3	2		2	2	2	



17AGX04 CLIMATE CHANGE AND ADAPTATION					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To understand the concept of earth climate system	1.1	Assess the greenhouse effect and climate change		
2.0	To acquire knowledge on atmosphere and its pattern	2.1	Analysis temperature profile and pollution dispersion pattern		
3.0	To understand the concept of climate change and its impacts	3.1	Apply the impact analysis in Agriculture, Forestry and Ecosystem		
4.0	To learn the concept of climate change and carbon credits	4.1	Apply clean development mechanism.		
5.0	To understand the concept of mitigation measures of climate change	5.1	Apply alternate energy sources.		

UNIT I – EARTH’S CLIMATE SYSTEM	(9)
Role of ozone in environment - ozone layer - ozone depleting gases - Green House Effect, Radiative effects of Greenhouse Gases - Hydrological Cycle - Green House Gases and Global Warming – Carbon Cycle.	
UNIT II – ATMOSPHERE AND ITS COMPONENTS	(9)
Importance of Atmosphere - Physical Chemical Characteristics of Atmosphere - Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability - Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion.	
UNIT III – IMPACTS OF CLIMATE CHANGE	(9)
Causes of Climate change : Change of Temperature in the environment - Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions – Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.	
UNIT IV – OBSERVED CHANGES AND ITS CAUSES	(9)
Climate change and Carbon credits- CDM- Initiatives in India-Kyoto Protocol Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC– IPCC – Evidences of Changes in Climate and Environment – on a Global Scale and in India .	
UNIT V – CLIMATE CHANGE AND MITIGATION MEASURES	(9)
Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry - Carbon sequestration – Carbon capture and storage (CCS) - Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007.

REFERENCES:

1. Adaptation and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge, 2006.
2. Atmospheric Science, Wallace, J.M., and Hobbs, P.V., Elsevier / Academic Press 2006.
3. Jan C. van Dam, Impacts of "Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press, 2003.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3	3	2	2			2	2	3	
2	3	3	3	3	2			2	2			2	2	
3	3	3	3	2	3		2		3		3	3	3	
4	3	2	2	2	2			2			2	3	2	
5	3	2	2	2	3			3			3	2	2	
CO(W.A)	3	3	3	2	3	3	2	2	3		3	2	2	

17AGX05 REFRIGERATION AND AIR CONDITIONING FOR AGRICULTURAL ENGINEERS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To acquire knowledge on principles of refrigeration	1.1	Explain refrigeration cycle		
2.0	To understand the components and working of refrigerator	2.1	Detect problems in refrigerator		
3.0	To understand the properties of refrigerant	3.1	Select suitable refrigerant for effective refrigeration without environmental pollution		
4.0	To understand working and application of air conditioning system	4.1	Apply air conditioning according to weather		
5.0	To know the application of refrigeration in agriculture	5.1	Design refrigerator vehicle and cold storage		

UNIT I - REFRIGERATION -VAPOUR COMPRESSION SYSTEM	(9)
Refrigeration – principles - refrigeration effect – coefficient of performance – units of refrigeration - simple vapour compression cycle – T-S diagram – p-h chart- vapour compression system-different types-solving problems.	
UNIT II - REFRIGERATION COMPONENTS	(9)
Refrigeration components – compressor – classification - principle and working – condensers -types - construction, principle and working. Evaporators – types-principle and working. Expansion device – types construction, principle and working.	
UNIT III - REFRIGERANTS AND VAPOUR ABSORPTION CYCLE	(9)
Refrigerants – properties – classification – comparison and advantages – chloroflouro carbon (CFC) refrigerants - effect on environmental pollution - alternate refrigerants - vapour absorption cycle – simple and practical vapour absorption system- advantages- ideal vapour absorption system- Electrolux refrigerator – Lithium-bromide refrigeration-construction and principles.	
UNIT IV – AIR CONDITIONING SYSTEM	(9)
Air conditioning systems-equipments used-classification-comfort and Industrial air conditioning system- Winter, summer and year- round air conditioning system- unitary and central air conditioning system- application of refrigeration and air conditioning-domestic refrigerator-refrigerated trucks- ice manufacture.	
UNIT V - APPLICATION OF REFRIGERATION IN AGRICULTURE	(9)
Cold chain concept to minimize post harvest losses. Role and importance of refrigerator vehicle. Design of cold storage	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Sadhu Singh. 2017. Refrigeration and Air Conditioning. Khanna Book Publishing Co. (P). Ltd.
2. Kurmi.R.S and J.K.Gupta. 2002. A Text book of Refrigeration and Air conditioning. Eurasia Publishing House (P) Ltd, Ram Nagar, New Delhi.

REFERENCES:

1. Bellaney, P.L. 2001. Thermal Engineering. Khanna Publishers, New Delhi.
2. William, H.S., R.F. Julian, 1986. Air conditioning and Refrigeration. John Wiley & Sons, Inc. London.
3. Arora, C. P. 1981. Refrigeration and Air conditioning. Tata-McGraw-Hill Publishing Co., New Delhi.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1		1		2	1				1		2
2	3		1		2		2				2		1	1
3	2		2		1	2	3	2				1		2
4	2					2	3							1
5	3	2	3	2	2	3	2		1			2	2	3
CO(W.A)	3	2	2	2	2	2	2	2	1		2	1	2	2

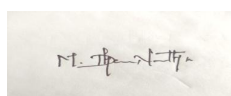
17AGX06 – PACKAGING AND STORAGE TECHNIQUES FOR AGRICULTURAL COMMODITIES					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To understand the storage losses of food grains	1.1	Control the losses of food grains		
2.0	To gain knowledge on storage methods	2.1	Select suitable storage methods to minimize loss		
3.0	To gain knowledge on functions of packaging materials	3.1	Suggest suitable packaging materials for different kinds of food		
4.0	To acquire knowledge on various testing methods for packaging methods	4.1	Test the properties of packaging materials		
5.0	To impart knowledge on special packaging techniques	5.1	Assess the packaging techniques for different kinds of food		

UNIT I - SPOILAGE AND STORAGE LOSSES	(9)
Direct damages, indirect damages of perishable and durable commodities – control measures - factors affecting storage – types of storage – Losses in storage and estimation of losses.	
UNIT II - STORAGE METHODS	(9)
Improved storage methods for grain-modern storage structures- infestation-temperature and moisture changes in storage structures-CAP storage-CA storage of grains and perishables-construction operation and maintenance of CA storage facilities- cold storage.	
UNIT III - FUNCTIONS OF PACKAGING MATERIALS	(9)
Introduction – packaging strategies for various environment – functions of package – packaging materials – cushioning materials – bio degradable packaging materials – shrink and stretch packaging materials.	
UNIT IV - FOOD PACKAGING MATERIALS AND TESTING	(9)
Introduction – paper and paper boards - flexible - plastics - glass containers – cans - aluminium foils - package material testing-tensile, bursting and tear strength.	
UNIT V - SPECIAL PACKAGING TECHNIQUES	(9)
Vacuum and gas packaging - aseptic packaging - retort pouching – edible film packaging – tetra packaging – antimicrobial packaging – shrink, stretch and active packaging.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
1. D.W.Hall 1990. Handling and Storage of Food grains in tropical and sub tropical areas. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.	
2. Richard Coles, Derek Mcdowell and Mark J. Kirwan. 2003. Food Packaging Technology, CRC press, London. 2nd Edn	
3. Gordon L.Roberttson. 2006. Food Packaging-Principles and Practices. CRC	

REFERENCES:

1. Himangshu Barman. 2008, Post Harvest Food grain storage. Agrobios (India), Jodhpur.
2. Frank a. Paine and Heather Y. Paine. 1992. A Handbook of Food Packaging. Springer Science, New Delhi. 2nd Edition.
3. Food Packaging Technology, Hand book, 2004. NIIR Board, New Delhi
4. Chakaraverty, A. 2000. Third edition. Post harvest technology of cereals, pulses and oil seeds. Oxford & IBH publishing & Co. Pvt. Ltd. New Delhi.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		1	1			2		3	2	2	1
2	3		3		3	2			3			1		2
3	3		3		2	2	3		3		2		1	1
4	3		3		3	2	3		3		2	2	2	1
5	3		3		3	2	3				2	3	2	1
CO(W.A)	3		3		2	2	3		3		2	2	2	1



17AGX07 SEED TECHNOLOGY APPLICATIONS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To understand characteristics of seed	1.1	Classify seed based on seed characters		
2.0	To gain knowledge on seed production and certification process	2.1	Apply techniques for seed production and certify seed		
3.0	To learn various seed processing and testing methods	3.1	Apply techniques for seed processing		
4.0	To understand various seed developing programmes	4.1	Plan programmes for seed development		
5.0	To gain knowledge on seed production in specific crops	5.1	Produce seeds in specific crops		

UNIT I - SEED CHARACTERS	(9)
Definition and characteristics of seed and how it differs from grain; Propagation of crop plants through true seed and vegetative means; Features of good quality seed; Importance of seed in successful crop production; Floral biology: self and cross pollination; Methods of genetic improvement of crop plants such as selection, hybridization, mutation and polyploidy; Seed legislations promulgated in India from 1966 to date and the purpose of each of these legislations.	
UNIT II - SEED PRODUCTION AND CERTIFICATION	(9)
Multiplication of seed and seed material: systems of seed multiplication, classes of seed, multiplication models, multiplication ratio, field selection, planting ratio, isolation needs and rouging; Harvest and extraction of seed; Methods of hybrid seed production; Genetic deterioration during crop production cycles; Seed certification process: legal basis, pre-requisites for applicability, detailed description of the specific steps of the certification process (with particular Semphasis on field inspection).	
UNIT III - SEED PROCESSING AND TESTING	(9)
Components of seed processing in a broader sense; Steps in seed processing in its narrower sense: preliminary cleaning, basic cleaning and grading, and equipment used in each of the steps; Seed treatment; Seed drying; Seed sampling; Seed testing: details of specific tests conducted for different purposes (service, certification and seed law enforcement); Standards prescribed for different crops.	
UNIT IV - DEVELOPING SEED PROGRAMMES	(9)
Types of organizations involved in seed production (public, quasi-governmental, private and cooperative), and their objectives and features; Organizational set up of a seed company; Steps involved in planning and developing a seed programme; Seed marketing activities, and analysis of seed demand and supply; Costing and pricing strategies; Economics of production of different crop seed; Seed packaging; Opportunities for Indian seed companies to have a greater share of world seed market; Visit to seed organizations; Preparing seed projects to obtain credit; Export procedures and formalities; Seed/plant quarantine methods.	

UNIT V - SEED PRODUCTION IN SPECIFIC CROPS	(9)
Principles and special techniques used for seed production in important horticultural crops by selecting representatives of vegetable / flower / fruit / spice / condiment / plantation crops.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Singh, S.P., Commercial Vegetable Seed Production, Kalyani Publishers, Chennai, 2001. 2. Agarwal, R.L., Seed Technology, Oxford IBH Publishing Co., New Delhi, 1995. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Subir Sen and Ghosh, N., Seed Science, Kalyani Publishers, Chennai, 1999. 2. Dahiya, B.S., and Rai, K.N., Seed Technology, Kalyani Publishers, Chennai, 1997. 3. George, Raymond, A.T., Vegetable Seed Production, Longman Orient Press, London and New York, 1985. 4. Hand Book of Seedling Evaluation, ISTA, 1979. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2				3			2				1		
2	2		2		3						2	2	3	1
3	2		3		3			1			3	2	1	3
4	1		2					2			3	3		1
5	2		1		3						2	2	3	1
CO(W.A)	2		2		3			2			3	2	2	2

17AGX08 WATERSHED MANAGEMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To understand the concept of watershed	1.1	Apply the land use pattern in watershed		
2.0	To impart knowledge on planning of watershed	2.1	Estimate watershed planning		
3.0	To understand the watershed management strategies	3.1	Apply water conservation practices in irrigated lands and dry lands		
4.0	To understand the concept of water conservation practices	4.1	Implement the water harvesting techniques for effective ground water recharge		
5.0	To acquire knowledge on watershed development programme	5.1	Adopt suitable techniques in watershed development		

UNIT I – INTRODUCTION	(9)
Watershed – Definition - concept - challenges – Land capability classification - priority watersheds - land resource regions in India.	
UNIT II - WATERSHED PLANNING	(9)
Planning principles – collection of data – present land use - Preparation of watershed development plan - Estimation of costs and benefits - Financial plan – selection of implementation agency - Monitoring and evaluation system.	
UNIT III - WATERSHED MANAGEMENT	(9)
Participatory Irrigation Management - run off management - Factors affecting runoff – Temporary, Permanent gully control measures - Water conservation practices in irrigated lands - Soil and moisture conservation practices in dry lands.	
UNIT IV - WATER CONSERVATION PRACTICES	(9)
In-situ & Ex-situ moisture conservation principle and practices - Afforestation principle - Micro catchment water harvesting - Ground water recharge – percolation ponds -Water harvesting - Farm pond - Supplemental irrigation - Evaporation suppression - Seepage reduction.	
UNIT V - WATERSHED DEVELOPMENT PROGRAMME	(9)
River Valley Project (RVP) - Hill Area Development Programme (HADP) - National Watershed Development Programme for Rainfed Agriculture (NWDPR) - Other similar projects operated in India – Govt. of India guidelines on watershed development programme - Watershed based rural development – infrastructure development - Use of Aerial photography and Remote sensing in watershed management - Role of NGOs in watershed development.	
TOTAL (L: 45) = 45 PERIODS	

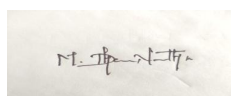
TEXT BOOKS:

1. Suresh, R. 2005. Soil and Water Conservation Engineering, Standard Publishers & Distributors, New Delhi.
2. Ghanashyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000.

REFERENCES:

1. Gurmel Singh et al. 2004. Manual of soil and water conservation practices. Oxford & IBH publishing Co. New Delhi.
2. Suresh, R. 2008. Land and water management principles, Standard Publishers & Distributors, New Delhi.
3. Tripathi R.P. and H.P.Singh 2002, Soil erosion and conservation, Willey Eastern Ltd., New Delhi
4. Murthy, V.V.N. 2005, Land and water management, Kalyani publishing, New Delhi.
5. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		2		1	1			2	1		3
2	3	1	2	1	2			2	1			2		2
3	3	1	3	1	2		1		2		1	3		3
4	3		2		2							2		2
5	3		3		2							3		3
CO(W.A)	3	1	3	1	2		1	2	2		2	2		3



17AGX09 ON FARM WATER MANAGEMENT				
			L	T
			3	0
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To acquire the knowledge on design of irrigation channels	1.1	Apply the Kennedy's and Lacey's theories to design the irrigation channels	
2.0	To gain the knowledge on command area development programme	2.1	Describe water distributing system in command area	
3.0	To acquire knowledge on surface and ground water resources	3.1	Apply Markov chain method in rainfall analysis	
4.0	To understand the concept of water balance	4.1	Calculate water use efficiency in field level	
5.0	To understand the concept of socio-economic prospective in farm water management	5.1	Calculate water pricing in command area	

UNIT I - DESIGN OF IRRIGATION CHANNELS	(9)
Design of Erodible and Non-Erodible, Alluvial channels- Kennedy's and Lacey's Theories - Materials for Lining watercourses and field channel - Water control and Diversion structure - Design - Land grading - Land Leveling methods.	
UNIT II - COMMAND AREA	(9)
Command area - Concept – CADA Programmes in Tamil Nadu - Duty of water - expression - relationship between duty and delta - Warabandhi - water distribution and Rotational Irrigation System – case studies.	
UNIT III - CONJUNCTIVE USE OF SURFACE AND GROUNDWATER	(9)
Availability of water - Rainfall, canal supply and groundwater – Irrigation demand - water requirement and utilization - Prediction of over and under utilization of water – Dependable rainfall – Rainfall analysis by Markov chain method – Probability matrix.	
UNIT IV - WATER BALANCE	(9)
Groundwater balance model – Weekly water balance - Performance indicators – Adequacy, Dependability, Equity and efficiency – conjunctive use plan by optimization – Agricultural productivity indicators – Water use efficiency.	
UNIT V - SPECIAL TOPICS	(9)
National water policy - Institutional aspects - Socio-economic perspective- Reclamation of salt affected soils- Seepage loss in command area- Irrigation conflicts- Water productivity – Water pricing.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Michael, A.M. Irrigation Theory and practice, Vikas publishing house, New Delhi, 2006

REFERENCES:

1. Keller, J. and Bliesner D.Ron, 2001 Sprinkler and Trickle irrigation, An ari book, Published by Van No strand Rein hold New York.
2. Israelson, 2002, Irrigation principles and practices, John Wiley & sons, New York.
3. Modi, P.N., 2002. Irrigation and water resources and water power engineering, Standard Book House, New Delhi.
4. Michael, A.M. and Ojha, T.P. 2002. Principles of Agricultural Engineering Vol II Jain Brothers, New Delhi.
5. Suresh, R. 2008. Land and water management principles, Standard Publishers & Distributors, New Delhi.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3	3	2	2			2	3	3	
2	3	3	3	3	2			2	2			2	2	
3	3	3	3	2	3		2		2		3	2	3	
4	3	2	2	2	2			2			2	3	2	
5	3	2	2	2	3			3			2	3	3	
CO(W.A)	3	3	3	2	3	3	2	2	2		2	3	3	

17AGX10 MECHANICS OF TILLAGE AND TRACTION				
			L	T
			3	0
			P	C
			0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To understand the basic concept of tillage	1.1	Determine soil properties, stress strain relationship with tillage tools	
2.0	To gain knowledge on principles of dynamics of tillage	2.1	Design tillage tools	
3.0	To understand the basic concept of traction	3.1	Apply techniques for effective ploughing	
4.0	To understand the details of tyres	4.1	Test tyres and select proper tyre for effective traction	
5.0	To understand the concept of GIS application in soil dynamics	5.1	Apply GIS techniques for effective land preparation	

UNIT I - MECHANICS OF TILLAGE	(9)
Introduction to mechanics of tillage tools, engineering properties of soil, principles and concepts, stress strain relationship.	
UNIT II – DYNAMICS OF TILLAGE	(9)
Design of tillage tools principles of soil cutting, design equation, force analysis, application of dimensional analysis in soil dynamics performance of tillage tools.	
UNIT III – TRACTION	(9)
Introduction to traction and mechanics, off road traction and mobility, traction model, traction improvement, traction prediction	
UNIT IV – TYRES	(9)
Tyre size, tyre lug geometry and their effects, tyre testing	
UNIT V - APPLICATIONS	(9)
Soil compaction and plant growth, variability and geo statistics, application of GIS in soil dynamics.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Klenin, N.L.; Popov, I.F. and V.A. Sakum, (1985). Agricultural machines. Amerind Pub. Co. NewYork 2. Liljedahl, J. B., Turnquist, P. K., Smith, D. W. & Hoki, M. 1996. Tractors and their power units. Fourth ed. American Society of Agricultural Engineers, ASAE 3. Kepner, R. A., Roy Bainer and E. L. Barger. 1978. Principles of farm machinery. Third edition; AVI Publishing Company Inc: Westport, Connecticut. 	

REFERENCES:

1. Ralph Alcock.1986. Tractor Implements System. AVI Publ.
2. Jain, S. C. Farm Machinery- An Approach

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3	3	2	2			2	3	3	
2	3	3	3	3	2			2	2			2	3	
3	3	3	3	2	3		2		2		3	2	3	
4	3	2	2	2	2			2			2	3	3	
5	3	2	2	2	3			3			2	3	3	
CO(W.A)	3	3	3	2	3	3	2	2	2		2	3	3	

17AGX11 SPECIAL FARM EQUIPMENT				
			L	T
			P	C
			3	0
			0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To impart knowledge on interculture equipment	1.1	Select and design interculture equipment	
2.0	To study about types, parts and function of sprayers and dusters	2.1	Calculate the particle size and area covered by different sprayers	
3.0	To gain knowledge on working principle of various harvesting equipments.	3.1	Select suitable harvesting equipment	
4.0	To understand the construction and working of threshers and other machineries	4.1	Use fruit pluckers, tree shakers, post hole diggers and chaff cutter	
5.0	To understand the working principle of special farm equipment	5.1	Operate special farm equipment	

UNIT I - MOWERS AND WEEDING EQUIPMENT	(9)
Weeding and intercultural equipment. Junior hoe - guntaka - blade harrow - rotary weeders for upland and low land - selection, constructional features and adjustments - Spading machine – coir pith applicators - Mower mechanism – lawn mowers.	
UNIT II - SPRAYERS AND DUSTERS	(9)
Sprayers – Sprayer operation – boom sprayer - precaution - coverage - factors affecting drift. Rotating disc sprayers – Controlled Droplet Application (CDA) - Electrostatic sprayers - Areal spraying – Air assist sprayers - orchard sprayers - Dusters - types - mist blower cum duster - other plant protection devices, care and maintenance.	
UNIT III - THRESHERS AND HARVESTERS	(9)
Construction and adjustments - registration and alignment. Windrowers, reapers, reaper binders and forage harvesters. Diggers for potato, groundnut and other tubers. Sugarcane harvesters - cotton pickers - corn harvesters - fruit crop harvesters – vegetable harvesters.	
UNIT IV - THRESHERS AND OTHER MACHINERIES	(9)
Thresher – construction and working of multi crop thresher. Forest machinery - shrub cutters - tree cutting machines – post hole diggers – Chaff cutter- flail mowers - lawn mowers – tree pruners.	
UNIT V - SPECIALIZED FARM EQUIPMENT	(9)
Pneumatic planters – air seeders – improved ploughs – reversible ploughs – suction traps – seed and fertilizer broadcasting devices, manure spreaders, sweep weeders – direct paddy seeders, direct paddy cum daincha seeder, coconut tree climbing devices, tractor operated hoist, tractor operated rhizome planter - Transplanters and Balers.	
TOTAL (L: 45) = 45 PERIODS	

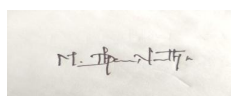
TEXT BOOKS:

1. Jagdishwar Sahay. 2010. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi 6.
2. Michael and Ojha. 2005. Principles of Agricultural Engineering. Jain brothers, New Delhi.

REFERENCES:

1. Kepner, R.A., et al. 1997. Principles of farm machinery. CBS Publishers and Distributors, Delhi.
2. Harris Pearson Smith et al. 1996. Farm machinery and equipments. Tata McGraw-Hill pub., New Delhi.
3. Srivastava, A.C. 1990. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3	3	2	2			2	3	3	
2	3	3	3	3	2			2	2			2	3	
3	3	3	3	2	3		2		2		3	2	3	
4	3	2	2	2	2			2			2	3	3	
5	3	2	2	2	3			3			2	3	3	
CO(W.A)	3	3	3	2	3	3	2	2	2		2	3	3	



17AGX12 SOIL AND WATER CONSERVATION ENGINEERING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To understand the concept soil erosion	1.1	Apply universal soil loss equation to estimate the soil erosion process.		
2.0	To acquire knowledge on erosion control techniques	2.1	Adopt the techniques bunds and terraces to control erosion		
3.0	To learn the concept gully control structures	3.1	Adopt the techniques wind breaks and shelter breaks to control gully erosion		
4.0	To understand the concept the watershed management system	4.1	Know planning and development watershed		
5.0	To acquire knowledge on water harvesting techniques	5.1	Adopt the water harvesting techniques like farm pond and percolation pond		

UNIT I - SOIL EROSION	(9)
Problems of soil erosion - Geological and Accelerated erosion, Factors affecting water erosion, Types of water erosion - Splash, sheet and rill, Gully, stream bank and road erosion and ravines, Universal Soil Loss Equation (USLE) & soil loss tolerance, Rainfall Erosion Index, Soil erodibility Index, Slope, slope length and topographical factors, Crop management for soil erosion 'C' factor, Conservation practice factor 'P', Measurement of runoff and soil loss - Multislot divisor unit - Coshocton rotating wheel sampler - Rainfall simulation and simulator - Sediment yield and sedimentation, Wind erosion mechanics - Methods of estimation of wind erosion - Desertification, deforestation and shifting cultivation.	
UNIT II - EROSION CONTROL	(9)
Erosion control measures, Contour bunds and Graded bunds, Broad beds and furrows, wide based terraces and dykes, Random tie ridging, basin listing and mulching, Bench terraces, stone walls and contour trenches, - Contour cultivation, strip cropping, mixed cropping, mixed farming, crop rotation for erosion control, Afforestation - Diversion drains and vegetative water ways.	
UNIT III - GULLY CONTROL STRUCTURES	(9)
Gully control and control of landslides, Temporary gully control measures, Permanent Gully Control Structures - Wind erosion control - wind breaks and shelter belts.	
UNIT IV - WATERSHED MANAGEMENT	(9)
Watershed – concept – planning, Principles – Components of watershed development – Watershed management plan - Biological. Watershed management plan – Engineering.	

UNIT V - WATER HARVESTING	(9)
Water harvesting methods, Farm pond – lined and unlined – Computation of capacity, Percolation pond – Selection of site – components, Dry farming techniques for improving crop production.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> Suresh, R. 2012. Soil and Water Conservation Engineering, Standard Publishers & Distributors, New Delhi. Michael, A.M. and Ojha, T.P. 2012. Principles of Agricultural Engineering Vol II Jain Brothers, New Delhi. 	
REFERENCES:	
<ol style="list-style-type: none"> Gurmel Singh et al. 1996. Manual of soil and water conservation practices. Oxford & IBH publishing Co. New Delhi. Murthy, V.V.N. and Madan K. Jha. 2013, Land and water management, Kalyani publishing, New Delhi. Gustafson, A.F., 2011. Conservation of the soil. Biotech Books, New Delhi-35 Ghanshyam das. 2009. Hydrology and soil conservation engineering. PHI learning private limited, New Delhi-1 Jana, B.L. 2008. Water harvesting and watershed management. Agrotech Publishing Academy, Udaipur-2 Juyal, G.P., V.N. Sharda. 2010. Water harvesting techniques and drainage line treatments in a watershed. Agrotech Publishing Academy, Udaipur-1. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3					3					3	2	
2	3	3	2		2		3					3	2	
3	3	2	2		3		3						3	
4	3	1	3			3	3	2	3	2	3		3	1
5	3	1	2		2	3	3					2	3	1
CO(W.A)	3	2	2		2	3	3	2	3	2	3	3	3	1

17AGX13 SUSTAINABLE AGRICULTURE					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To understand the concept of land resources and land degradation	1.1	Determine land utilization and cropping pattern in India		
2.0	To understand the concept of water resources and utilizable water in future	2.1	Estimate rainfall, drought and irrigation potential in watershed		
3.0	To get knowledge on sustainable agriculture and its components	3.1	Execute natural farming principle for sustainable agriculture		
4.0	To acquire knowledge on trends in food production	4.1	Estimate the food supply and demand projections		
5.0	To understand the concept of policies of Natural Resources Use and sustainable livelihood	5.1	Able to execute the policies for food security.		

UNIT I – LAND RESOURCE AND ITS SUSTAINABILITY	(9)
Land Resources of India, Population and land, Land utilization, Net Area Sown, changes in cropping pattern, land degradation.	
UNIT II – WATER RESOURCE AND ITS SUSTAINABILITY	(9)
Rainfall forecasting - Adequacy of Rainfall for crop growth – Rainfall, Drought and production instability – Irrigation potential – Available, created and utilized – River basins; Watersheds and Utilizable surface water – Utilizable water in future (Ground water & Surface water).	
UNIT III – SUSTAINABLE AGRICULTURE & ORGANIC FARMING	(9)
Agro-ecosystems - Impact of climate change on Agriculture, Effect on crop yield, effect on Soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance – Natural farming principles – Sustainability in rainfed farming – organic farming – principles and practices.	
UNIT IV – FOOD PRODUCTION AND FOOD SECURITY	(9)
Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force – Rural Land Market – Emerging Water market – Vertical farming - Sustainable food security indicators and index – Indicator of sustainability of food Security – Path to sustainable development.	
UNIT V – POLICES AND PROGRAMMES FOR SUSTAINABLE AGRICULTURE AND FOOD SECURITY	(9)
Food and Crop Production polices – Agricultural credit Policy – Crop insurance –Policies of Natural Resources Use – Policies for sustainable Livelihoods – Virtual water and trade - Sustainable food Security Action Plan.	
TOTAL (L: 45) = 45 PERIODS	

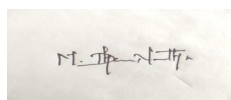
TEXT BOOKS:

1. Desai, B.K., and Pujari, B.T. Sustainable Agriculture: A vision for future, New India Publishing Agency, New Delhi, 2007.
2. Saroja Raman, Agricultural Sustainability – Principles, Processes and Prospects, CRC Press, 2013.

REFERENCES:

1. Swarna S. Vepa et al., Atlas of the sustainability of food security. MSSRF, Chennai, 2004.
2. Sithamparanathan, J., Rengasamy, A., Arunachalam, N. Ecosystem principles and sustainable agriculture, Scitech Publications, Chennai, 1999.
3. Gangadhar Banerjee and Srijeet Banerji, Economics of sustainable agriculture and alternate production systems, Ane Books Pvt Ltd., 2017
4. Swaminathan, M.S. Science and sustainable food security, World Scientific Publishing Co., Singapore, 2010.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3	3	2	2			2	3	3	
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3	3	3	3	2	3		2		2		3	2	3	
4	3	2	2	2	2			2			2	3		2
5	3	2	2	2	3			3			2	3		2
CO(W.A)	3	3	3	2	3	3	2	2	2		2	3	3	2



17AGX14 BUILDING MATERIALS AND FARM STRUCTURES					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To recognize the good materials to be used for the construction work.	1.1	Describe the classification of construction materials		
2.0	To understand the functions of Lintels and Arches.	2.1	Design Lintels and Arches in farm structures.		
3.0	To select materials, design and supervision of suitable type of floor and roof.	3.1	Determine the flooring type required for a selected farm structure.		
4.0	To gain knowledge about doors, windows, ventilators and to take suitable engineering measures.	4.1	Apply safety standards in selecting location of doors and windows in farm structures.		
5.0	To understand the concept of man-machine system.	5.1	Design all types of farm structures		

Unit I - BUILDING MATERIALS	(9)
Stone as building material; Bricks; Classification, Requirement of good bricks. Cement Concrete blocks, Sizes, requirement of good blocks. Mortar: types and requirements. Timber as construction material, Fine aggregate: Natural and manufactured; Coarse aggregate: Natural and manufactured; Concrete: types and requirements.	
Unit II - LINTELS AND ARCHES	(9)
Lintels and Arches: Definition, function and classification; Arches: Elements and Stability of an Arch. Balconies, chejja and canopy.	
UNIT III - FLOORS AND ROOFS	(9)
Floors; Requirement of good floor, Components of ground floor, Selection of flooring material, Laying of Concrete, Mosaic, Marble, Granite, Tile flooring, Cladding of tiles. Roof;-Requirement of good roof, Types of roof, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R.C.C. Roof.	
UNIT IV - DOORS, WINDOWS AND VENTILATORS	(9)
Location of doors and windows, technical terms, Materials for doors and windows, Paneled door, Flush door, Collapsible door, rolling shutter, PVC Door, Paneled and glazed Window, Bay Window, French window. Ventilators. Sizes as per IS recommendations.	
UNIT V - FARM STRUCTURES	(9)
Introduction to Farm Structures, Types -Farmstead, Stall barn, loose housing and milk parlors, poultry house, sheep / goat house, silos – over ground and underground and hay storages, Farm fencing system, Machinery and equipment shed and workshops, Septic tank and sanitary structures	
TOTAL (L: 45) = 45 PERIODS	

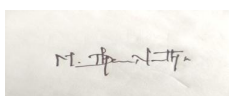
TEXT BOOK:

1. Sushil Kumar "Building Materials and construction", 20th edition, reprint 2015, Standard Publishers
2. Dr. B.C.Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction", Laxmi Publications (P) Ltd., New Delhi.

REFERENCES:

1. National Building Code(NBC) of India
2. P C Vergese, "Building Materials", PHI Learning Pvt. Ltd.
3. Jagadish.K.S, "Alternative Building Materials Technology", New Age International, 2007.
4. Rangawala S. C. "Engineering Materials", Charter Publishing House, Anand, India.
5. Thomas E., Frederick W. "Agricultural Drawing and the Design of Farm Structures", McGraw-Hill Book Company.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3		1	1	2		2	1	2	2
2	3		3		2		1	1			2	2		2
3	3		3		2		2	2			2	2		2
4	3		2		2		2	2			1	1		2
5	3		2		2							1	2	2
CO(W.A)	3		3		2		2	2	2		2	1	2	2



17AGX15- EXTENSION METHODS AND TRANSFER OF TECHNOLOGY					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To impart knowledge on communication and programme planning	1.1	Understand the programme planning		
2.0	To gain knowledge on extension teaching methods	2.1	Understand the different extension teaching methods		
3.0	To understand the different Modern Communication Gadgets	3.1	Use modern communication gadgets		
4.0	To learn the diffusion and adoption	4.1	Gain the knowledge of diffusion and adoption		
5.0	To understand the concepts of capacity building	5.1	Train the farmers through extension methods		

UNIT I - COMMUNICATION AND PROGRAMME PLANNING	(9)
Communication – meaning – definition – models – elements and their characteristics – types and barriers in communication. Programme planning – meaning, definition, principles, steps in programme development process, monitoring and evaluation of extension programmes.	
UNIT II - EXTENSION TEACHING METHODS	(9)
Extension teaching methods - Audio-Visual aids – definition – classification – purpose, planning and selection, combination and use – individual, group and mass contact methods – merits and demerits.	
UNIT III - MODERN COMMUNICATION GADGETS	(9)
Modern communication sources – internet, video and teleconferencing, Interactive Multimedia Compact Disk (IMCD), village kiosks, Kissan Call Centre (KCC), mobile phone	
UNIT IV - DIFFUSION AND ADOPTION	(9)
Diffusion – meaning and elements. Adoption – meaning –adopter categories and factors influencing adoption, stages of adoption, Innovation decision process and attributes of innovation consequences of adoption.	

UNIT V - CAPACITY BUILDING**(9)**

Capacity building of extension personnel and farmers – meaning – definition, types of training, training to farmers, farm women and rural youth, FTC & KVK.

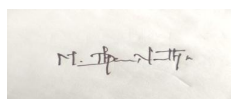
TOTAL (L: 45) = 45 PERIODS**TEXT BOOK:**

1. Ray, G.L., 1999. Extension Communication and Management, Naya Prokash, 206, Bidhan Sarani, Calcutta.
2. Rogers, E.M. 1995. Diffusion of Innovations, The Free Press, Newyork

REFERENCES:

1. Indian Journal of Social Sciences, Serials Publications, New Delhi
2. Agricultural Extension Review, Department of Agriculture and Co-operation, Ministry of Agriculture, New Delhi
3. MANAGE, NAARM, Hyderabad Yojana, Ministry of Rural Development, New Delhi
4. Sandhu, A.S. 1996. Extension Programme Planning, Oxford & IBH Publishing Co. pvt. Ltd, New Delhi

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1			1			1		3	2	3	2	2		
2			1			2		3	2	3	2	2		1
3			2		3	1		3	3	3	3	3		1
4			1		3			1	2	3	1	2		
5			2	2				2	2	3	2	3		
CO(W.A)			1	2	3	1		2	2	3	2	2		1



17AGX16 – FOOD PLANT DESIGN, FOOD SAFETY AND MANAGEMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN:			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To impart knowledge on selection of plant layout for industry	1.1	Analyze and apply the suitable plant layout for an industry.		
2.0	To learn the basic principles of Industrial safety and safety performance	2.1	Appraise the industrial safety performance and safety procedures		
3.0	To learn the basic knowledge about the Accidents happening in the industry	3.1	Identify and apply the suitable prevention methods for accidents		
4.0	To know about the basic knowledge about the food safety	4.1	Analyze and apply the suitable Food safety measures		
5.0	To impart knowledge on Food quality management system.	5.1	Understand the fundamental of concept of food quality management system.		

UNIT I - SELECTION OF PLANT LAYOUT	(9)
Introduction and classification of food plants, Site selection of plant. Plant location factors plant layout advantages types of layout-characteristics of an efficient layout. Techniques of plant layout. General requirements and considerations for construction, materials and floors. Drains and drain layout. Ventilation, fly control, mould prevention, illumination in food plants.	
UNIT II – INDUSTRIAL SAFETY AND SAFETY PERFORMANCE	(9)
Process industries, potential hazards, toxic chemicals and physical safety analysis. Safety Appraisal, effective steps to implement safety procedures, periodic inspection and safety procedures; proper selection and replacement of handling equipments, personal protective equipments.	
UNIT III -ACCIDENTS	(9)
Industrial accidents – accident costs – identification of accident spots, remedial measures, identification and analysis of causes of injury to men and machines – accident prevention -Fire prevention and fire protection.	
UNIT IV - CONTEMPORARY FOOD SAFETY STRATEGIES	(9)
Principles and Need for quality control and safety – Strategy and criteria for food safety- Consumer lifestyle and demand- Issues in Food safety. Impact of food safety on world trade issues.	
UNIT V - FOOD QUALITY MANAGEMENT SYSTEM	(9)
International Scenario on Food Safety , FSSAI Functions, duties & responsibilities of food safety regulators, Food safety and standards for food products. Advances in Food Safety & Quality Management, Food Safety Audit. ISO 22000. FSSC 22000	
TOTAL (L: 45) = 45 PERIODS	

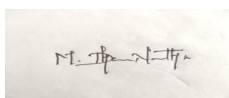
TEXT BOOKS:

1. Handley William, —Industrial Safety Hand Book , 2nd Edition, McGraw Hill, New York, 1969.
2. Da-Wen Sun., “Handbook of Food Safety Engineering”, John Wiley & Sons, New Jersey, 2011.

REFERENCE BOOKS:

1. Heinrich H.W., Dan Peterson P.E. and Nester Rood, —Industrial Accident Prevention , 2nd Edition, McGraw-Hill Book Co., 1980.
2. Blake R.P., —Industrial Safety , 3rd Edition, Prentice Hall Inc., New Jersey, 1993.
3. Ronald H. Schmidt, and Gary E. Rodrick., “Food Safety Handbook”, John Wiley & Sons, New Jersey, 2005.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3	2		3	2	2		2		2		2
2	3			3		2	2	2		2		2		3
3	3			2		2	2	2				1		2
4				2		2	3	3		2		3		3
5				2		3	3	3		2		2		3
CO(W.A)	3		3	2		2	2	2		2		2		3

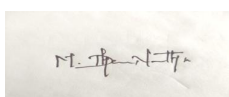


17AGX17 FUNDAMENTALS AND APPLICATION OF NANOTECHNOLOGY				
			L	T
			3	0
			P	C
			0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To introduce the principles of nanoscience	1.1	Understand the principles of nanotechnology	
2.0	To understand the synthesis of nanomaterials	2.1	Gain knowledge on synthesis of Nano materials	
3.0	To know the types of properties and characterization of nanomaterials	3.1	Describe the properties of Nano materials	
4.0	To gain knowledge on applications of nanotechnology at different fields	4.1	Apply nano technology in different fields	
5.0	To know about the nanotechnology applications in agriculture	5.1	Apply nano techniques in agriculture	

UNIT I - PRINCIPLES OF NANOSCIENCE	(9)
History, definition, terminology in nanoscience and importance of Moore's law. Nanomaterials – Semiconductor – Diode – Quantum Dots - Buckyball - CNT -characteristics – applications. Nanomaterials: Polymers - Types – PLGA – Coreshell nanoparticles - Micelles - characteristics – Applications. Biosensors – Principle, Components, Types, Applications.	
UNIT II - SYNTHESIS OF NANOMATERIALS	(9)
Top down and Bottom up approaches - Physical method, Physical Vapour Deposition (PVD), Etching - Molecular Beam Epitaxy – Sputtering – Lithography. Mechanical synthesis - Ball milling – Types - Mechanical alloying. Chemical synthesis – Sol-gel Method – Chemical Vapour Deposition (CVD) – electro-deposition- thin film. Biological synthesis using Microorganisms and Plants.	
UNIT III - PROPERTIES AND CHARACTERIZATION OF NANOMATERIALS	(9)
Mechanical, magnetic and thermal properties of nanomaterials. Optical and electrical properties of nanomaterials. Principle, components and application of nanotechnology equipments: Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Principle, components and application of nanotechnology equipments: X-ray Diffraction (XRD) – Fourier Transform Infra Red Spectroscopy (FT-IR) – Atomic Force Microscope (AFM).	
UNIT IV - APPLICATIONS OF NANOTECHNOLOGY	(9)
NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.	

UNIT V - NANOTECHNOLOGY APPLICATIONS IN AGRICULTURE	(9)
Agriculture – Nano fertilizers – Nano-herbicides – Nano-pesticides – Seed technology. Energy, Environment and Health. Nanotechnology in Food Systems – Nano foods, Nano-encapsulation of functional foods, Nano- packaging, Quality assessment. Social, Economic and Ethical Issues in Nanotechnology and Nano-toxicology.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOK:	
<ol style="list-style-type: none"> 1. Nano: The essentials understanding nanoscience and Nano- T. Pradeep - 2009 - Mc Graw Hill. 2. Nano materials - B. Viswanathan - 2009 - Narosa. 3. Introduction to nanotechnology - Charles P. Poole; Frank J. Owens – 2008 – Wiley. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Fundamentals of physics - David Halliday; Robert Resnick – 2007 – Willey. 2. Chemistry Raymond Chang – 2009 - Tata Mcgraw Hill. 3. Nanomaterial chemistry - C.N. Rao, A.K. Chettam, A. Muller – 2007 – Wiley – VCH. 4. Nanotechnology Applications in Agriculture – C.R. Chinnamuthu, B. Chandrasekaran and C. Ramasamy – 2008. 5. Fundamentals of biomems and medical microdevices - Steven S. Saliterman – 2006 - Wiley Interscience. 6. Instrumental methods of analysis - Hobart H. Willam; Lynne L. Merrit – 2006 - CBS. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3	2		3	1				1	1		1
2	3			3	2	2	2				1	2		1
3	3		3		3	2	2				1	1		2
4	3		2	2	2	2	1				2	3		2
5	3	2	2	2	3	3	3				2	1		3
CO(W.A)	3	2	3	2	3	2	2				1	2		2



17AGX18 HUMAN ENGINEERING AND SAFETY IN AGRICULTURE					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To understand the basic concept of human engineering	1.1	Describe the importance of human engineering		
2.0	To understand the human stress involved and methods of measurement	2.1	Determine the human stress involved using different methods		
3.0	To gain knowledge on anthropometry and biomechanics	3.1	Calculate the physical and mental capacities		
4.0	To understand the human limitations to stress and safety standards	4.1	Apply safety standards to avoid hazards in the farm		
5.0	To understand the concept of man-machine system	5.1	Design farm machines for human comfort		

UNIT I – INTRODUCTION	(9)
Concept and design criteria for optimum mutual adjustment of man and his work: Importance of ergonomics and its application in agriculture, liberation and transfer of energy in human body, concept of indirect calorimeter, work physiology in various agricultural tasks.	
UNIT II - HUMAN STRESS AND MEASUREMENT	(9)
Physiological stress indices and their methods of measurement: Mechanical efficiency of work, fatigue and shift work.	
UNIT III - ANTHROPOMETRY AND BIOMECHANICS	(9)
Anthropometric data and measurement techniques, joint movement and method of measurement, analysis and application of anthropometric data, measurement of physical and mental capacities.	
UNIT IV - HUMAN LIMITATIONS TO STRESS AND SAFETY STANDARDS	(9)
Human limitations in relation to stresses and demands of working environments. Mechanical environment; noise and vibration and their physiological effects, thermal environment; heat stress, thermal comfort, effect on performance and behavior, field of vision, color discrimination, general guidelines for designing visual display, safety standards at work place during various farm operations and natural hazards on the farm. Farm safety legislation.	
UNIT V - MAN-MACHINE SYSTEM CONCEPT	(9)
Human factors in adjustment of man and his work. Design aspects of foot and hand controls on tractors and farm equipment. Design of operator's seat for tractors and agricultural equipment. Problems of posture and comfort; science of seating cushion functional requirements, static and dynamic compatibility of operator-seat-machine; Engineering principles applied to industrial and agricultural safety. Road accidents, road signs and accident prevention; Safety symbols and signs, hand signals, colour codes for agricultural equipment.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. R.S. Bridger, Introduction to Ergonomics, McGraw Hill, 1995.
2. Charles D Reese, Accident / Incident Prevention Techniques, Taylor & Francis, 2001.
3. Gavriel Salvendy, Hand Book of Human Factors and Ergonomics, John Wiley & Sons, 1997.

REFERENCES:

1. J Mathews & AA Knight, Ergonomics in Agricultural Design, National Institute of Agric. Engineering, Wrest Park, Silsoe, Bedford, 1971.
2. Mathews J Sanders, Cormicks MS & MCEj, Human Factors in Engineering and Design, 4th Ed, McGraw Hill, 1976.
3. Lea and Febiger Zander J, Principles of Ergonomics, Elsevier, 1972.

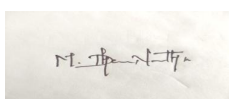
COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3					3	1					1		
2	3	3	3	3	2			2	2			2		
3	3	3	3	2	3			2	2		1	1		
4	3	2	2	2	2			2				3		2
5	3	2	2	2	3			3			2	1		2
CO(W.A)	3	3	3	2	3	3	1	2	2		2	2		2

17AGX19 DESIGN AND MAINTENANCE OF GREENHOUSE				
			L	T
			3	0
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To introduce the fundamentals of greenhouse technology	1.1	Understand the concepts of green house	
2.0	To impart knowledge on construction of green house	2.1	Gain the knowledge on construction of green house	
3.0	To know the green house environment	3.1	Control the green house environment	
4.0	To gain knowledge on green house media and nutrition	4.1	Prepare media for greenhouse plants	
5.0	To know about the IPM management and economics of green house	5.1	Able to manage the pest and diseases of green houses and analyse the economics	

UNIT I - FUNDAMENTALS OF GREENHOUSE TECHNOLOGY	(9)
Importance and methods of protected culture in horticultural crops - Importance and scope of protected cultivation – different growing structures of protected culture viz., green house, poly house, net house, poly tunnels, screen house, protected nursery house. Introduction to green house- history and advantages of green houses. Planning and designing of green house- site selection, structures and glazing. Introduction, basics of greenhouse design. Types of green house based on- shape, utility, construction, covering material	
UNIT II - CONSTRUCTION OF GREEN HOUSE	(9)
Framework for various types of green house- covering materials-wood, glass, polyethylene film, poly vinyl chloride film, tefzel T2 film, fiber glass reinforced plastic rigid panel. Construction of Poly house / Glass house / Net hose. Construction of pipe framed greenhouse. Design and layout of low cost green house structures. Automated greenhouses- application of computer in greenhouse technology	
UNIT III - GREEN HOUSE ENVIRONMENT	(9)
Heating – sources of heat. Cooling- types of cooling. Environmental control- air temperature, sunlight, co ₂ , relative humidity, wind, rain. Ventilation- different types of ventilation systems. cultivation systems including nutrient film technique / hydroponics / aeroponic culture.	
UNIT IV - GREEN HOUSE MEDIA AND NUTRITION	(9)
Preparation of soil and soil less media mixtures for planting. Plant nutrition- fertilizers, nutrient deficiencies and toxicities. Irrigation- water quality- methods of irrigation- hand watering, perimeter watering, overhead sprinklers, components of drip and sprinkler irrigation. Fertigation- devices used, advantages and disadvantages of fertigation.	

UNIT V - IPM MANAGEMENT AND ECONOMICS OF GREEN HOUSE	(9)
Pest and soil organisms of greenhouse plants, Diseases of greenhouse plants- management of pest and diseases- physical, chemical, biological- IPM. Methods of pesticide application and types of equipment for spray- PGRs for green house plants. Economic analysis of green house- Construction cost for basic green house and different types of greenhouse and their maintenance- total investment- variable cost, capital cost and fixed cost.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOK:	
<ol style="list-style-type: none"> 1. Joe.J.Hanan. 1998. Green houses: Advanced Technology for Protected Horticulture, CRC Press, LLC. Florida. 2. Paul V. Nelson. 1991. Green house operation and management. Ball publishing USA. 	
REFERENCES:	
<ol style="list-style-type: none"> 1. Lyn. Malone, Anita M. Palmer, Christine L. Vloghat Jach Dangeermond. 2002. Mapping out world: GIS lessons for Education. ESRI press. 2. David Reed. 1996. Water, media and nutrition for green house crops. Ball publishing USA. 3. Adams, C.R. K.M. Bandford and M.P. Early. 1996. Principles of Horticulture. CBS publishers and distributors. Darya ganj, New Delhi. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3		3	3						1	2	
2	3		3	3	2	2	2	2	2			2	3	
3	3		3		3	2	2	2				1	3	
4	3		2	2	2	2	1	2	3			3	2	
5	3		2	2	3	3	3	3	3			1	3	
CO(W.A)	3		3	2	3	2	2	2	3			2	3	



17AGX20 ORGANIC FARMING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN: TYPE – III			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To study the principles and practices of organic farming	1.0	Learn the basics of organic farming		
2.0	To know the soil health management practices through organic farming	2.0	Ability to manage soil health using organic management practices		
3.0	To learn different organic production technologies including certification	3.0	Produce organic crops using various organic production technologies		
4.0	To introduce different crop protection practices in organic farming	4.0	Protect crops using organic practices		
5.0	To expose the Post harvest technologies, export and market avenues	5.0	Export various organic products		

UNIT I - INTRODUCTION TO ORGANIC FARMING	(9)
Organic farming - concept - History - genesis and status of Organic farming in Tamil Nadu and India – Organic ecosystem and its concepts - Pre-requisites and basic steps for organic farming; conversion to organic farming - planning and processes in practices- IFS approach-Integration of animal components - Difference between conventional and organic agriculture - Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.	
UNIT II - SOIL MANAGEMENT IN ORGANIC FARMING	(9)
Soil health - concepts - problem diagnosis - conservation of soil - problem soil reclamation under organic farming - soil physical, chemical and biological improvement - organic carbon status and improvement strategies - sources of organics - production potentials - maintenance of soil health - long term effect	
UNIT III - PRODUCTION TECHNOLOGIES FOR ORGANIC FARMING	(9)
Crop production technologies - Response of crops and varieties - cropping systems - intercropping in relation to maintenance of soil productivity; Role of green manures and pulses - Indigenous Technical Knowledge (ITK'S) - Integrated Farming System (IFS) - Resource conservation - enhancing crop productivity and food production; Conservative irrigation practices - problems of modern irrigation system.	
UNIT IV - CROP PROTECTION IN ORGANIC FARMING	(9)
Weeds, Insects and diseases management under organic farming; Biological agents and pheromones, bio-pesticides for crop protection; Sustainable crop protection practices - ITK's in crop protection.	
UNIT V - POST HARVEST AND CERTIFICATION	(9)
Post harvest technology - preservation - value addition - quality parameters - marketing and export avenues; Organic certification - Standards and agencies - marketing and export avenues - certification for exports; Sustainability indices for evaluating long term and indirect benefits; Economic evaluation of organic agricultural technologies.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Dahama, A.K., "Organic Farming for Sustainable Agriculture", Agrobios (India), Jodhpur pp.301, 2002.
2. Palaniappan, SP. and K. Annadurai, "Organic farming: Theory and Practice", Scientific Publishers, Jodhpur, 1999.

REFERENCES:

1. Lampkin, N., "Organic farming", Ipswich, U. K . Farming Press Books pp.710, 1990.
2. Sharma, Arun K., "A Hand book of Organic Farming", Agrobios (India), Jodhpur pp. 627, 2002.
3. Thampan, P. K., "Organic Agriculture", Peekay Tree Crops Development Foundation, Cochin pp.354, 1995.
4. Vyas, S. C., Smriti Vyas, Sameer Vyas and H. A. Modi., "Biofertilizers and Organic farming", Akta Prakashan, Nadiad, pp.252,1998.
5. Anantha krishnan, T. N. (ed.), "Emerging Trends in Biological Control of Phytophagous Insects", Oxford & IBH,1992.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	2	3	3	1	2	1	1	1	1		
2	3	3	3	3	2	2	2	2	2	1	1	2		
3	3	3	3	2	3	2	2	2	2	1	1	1		
4	3	2	2	2	2	2	1	2	1	2	2	3		
5	3	2	2	2	3	3	3	3	3	2	2	1		
CO(W.A)	3	3	3	2	3	2	2	2	2	1	1	2		

17ECX16 – INTERNET OF THINGS AND ITS APPLICATIONS					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN : TYPE - 1			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To make the students to know about basics of Electrical and Electronic devices	1.1	Understand basics of Electrical circuits and Electronic devices		
2.0	To make the students to know about basics and block diagram of IoT	2.1	Understand IOT characteristics and its essential components.		
3.0	To make the students to know about Arduino processor and working of Analog and Digital I/O pins	3.1	Describe Arduino processor and working of Analog and Digital I/O pins		
4.0	To make the students to know about Raspberry pi and its interface with other devices	4.1	Understand Raspberry pi and its interface with other devices		
5.0	To motivate the students to implement the IoT using Arduino/ Raspberry Pi.	5.1	Implement a IoT system using Arduino/Raspberry Pi.		

UNIT I - BASIC ELECTRICAL CIRCUITS AND ELECTRONICS	(9)
Introduction - Current, voltage and resistance - Analog and Digital Signal - conductors Vs Insulators – KCL- KVL - Basic Electronics components - calculating equivalent resistance for series and parallel circuits- Ohm’s law- Color coding for a resistor – LED – LCD - LDR.	
UNIT II - INTRODUCTION TO INTERNET OF THINGS	(9)
Introduction - Definition and characteristics of Internet of Things - General Block Diagram and essential components of IOT - Role of microprocessor & Micro controller- communication of things - IOT connection with internet.	
UNIT III- ARDUINO PROCESSOR	(9)
Introduction to Arduino processor- General Block diagram- Working of Analog and Digital I/O pins- Serial (UART) , I2C Communications and SPI communication - Arduino Boards: Mega, Due, Zero and 101 - Prototyping basics - Technical description - Setting Up Arduino IDE- Introduction to Arduino programming.	
UNIT IV - RASPBERRY PI	(9)
Technical Description of Raspberry Pi - comparison of Raspberry Pi Vs Arduino - Operating Systems for RPi - Preparing SD Card for Pi - Connecting Raspberry Pi as PC - Exploring Raspberry Pi Environment- Logical design using Python.	
UNIT V- APPLICATIONS OF IOT	(9)
Various Real time applications of IoT- automation - Smart Parking - Environment: Weather monitoring system - Agriculture: Smart irrigation – Domain Specific applications.	
TOTAL (L: 45) = 45 PERIODS	

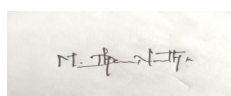
TEXT BOOK:

1. Arshdeep Bahga, Vijay Madiseti, "Internet of Things-A hands-on approach", Universities Press, 2015.

REFERENCES :

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, (2006).
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", Wiley Publications 2nd edition, 2013.
3. Marco Schwartz, — Internet of Things with the Arduino Yun, Packt Publishing, 2014.
4. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2012.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3	2					2					
2	3	3		3	2									
3	3	3	3				2							
4	3	2	2							2				
5	3					3					2	2		
CO(W.A)	3	3	3	3	2	3	2		2	2	2	2		



17ITX26- PROBLEM SOLVING AND ALGORITHMIC SKILLS					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL		QUESTION PATTERN : TYPE - 1			
COURSE OBJECTIVES AND OUTCOMES					
Course Objectives		Course Outcomes: The Student will be able to			
1.0	To impart fundamental concepts of OOP using python	1.1	Understand the basics of object oriented concepts in python.		
2.0	To gain exposure about inheritance and polymorphism	2.1	Develop applications using inheritance and polymorphism		
3.0	To understand the abstract data types and tree data structures	3.1	Implement the ADTs and trees		
4.0	To see how graphs and heaps can be used to solve a wide variety of problems	4.1	Design graph abstract data type and heap		
5.0	To understand the sorting techniques and shortest path algorithms.	5.1	Implement the sorting techniques and shortest path algorithms.		

UNIT I - MOTIVATION OF FUNDAMENTAL CONCEPT IN PROGRAMMING	(9)
Implementation of Classes and Objects in Python - Class Attributes and Instance Attributes - 'self' parameter - Static Methods and Instance Methods - init() method	
UNIT II - ADVANCED FEATURES IN CONCEPT OF PROGRAMMING	(9)
Performing Abstraction and Encapsulation in Python - Single Inheritance - Multiple Inheritance - Multilevel Inheritance - Public, Protected and Private - Naming Conventions. Polymorphism- Overriding and the super() method - Diamond Shape Problem in Multiple Inheritance - Overloading an Operator - Implementing an Abstract Base Class (ABC)	
UNIT III - INTRODUCTION TO ALGORITHMIC THINKING AND PEAK FINDING	(9)
Array data structure - Linked List Data Structure and Its Implementation - Stacks and Queues - Binary Search Trees - Balanced Trees: AVL Trees and Red-Black Trees	
UNIT IV - MAPPING VALUES AND PRINCIPLE OF OPTIMALITY	(9)
Heaps - Heapsort Algorithm - Associative Arrays and Dictionaries - Ternary Search Trees as Associative Arrays - Basic Graph Algorithms - Breadth - First And Depth - First Search - Spanning Trees	

UNIT V - ANALYZING NUMBER OF EXCHANGES IN CRAZY-SORT	(9)
Shortest Path Algorithms, Dijkstra's Algorithm - Bellman-Ford Algorithm - Kruskal Algorithm - Sorting Algorithms- Bubble Sort, Selection Sort and Insertion Sort - Quicksort and Merge Sort, Non-Comparison Based Sorting Algorithms, Counting Sort and Radix Sort	
TOTAL (L: 45) = 45 PERIODS	

<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Dusty Phillips, Python 3 Object-oriented Programming, Packt Publishing, Second Edition. 2. Bradley N. Miller, David L. Ranum,- Problem Solving with Algorithms and Data Structures Using Python, Franklin, Beedle & Associates, 2011. <p>REFERENCES:</p> <ol style="list-style-type: none"> 1. Mark Summerfield - Programming in Python 3, Pearson Education, 2nd Edition 2. Michael T. Goodrich, Irvine Roberto Tamassia, Michael H. Goldwasser, - Data Structures and Algorithms in Python , 2013 edition.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3									1		
2	3	3	3	3	2						1	2		
3	3	3	3	2	3						1	1		
4	3	2	2	2	2						2	3		
5	3	2	2	2	3						2	1		
CO(W.A)	3	3	3	2	3						2	2		

17CSX31- PROBLEM SOLVING AND PROGRAMMING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : 17CSC01 / 17CSC02			QUESTION PATTERN : TYPE 1		
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To gain knowledge about the basics of programming	1.1	Understand the basics of Python Programming constructs.		
2.0	To gain exposure about selection structure	2.1	Design programs involving selection structure		
3.0	To get knowledge about repetition structure, function and modules	3.1	Design programs involving function, modules and loops.		
4.0	To gain exposure about string	4.1	Realize the need of strings.		
5.0	To get knowledge about mutable and Immutable types	5.1	Realize the need of list, tuples and dictionary.		

UNIT I - INTRODUCTION TO BASICS OF PROGRAMMING	(9)
Basics - Variables and Assignment - Basic Data Types- Comments - Operators - print() - Floats	
UNIT II - SELECTION STRUCTURE	(9)
Introduction to Selection Structure - if statements, else statements, nested elif statements, truthy and falsey values, Control Structure	
UNIT III - VALUE – REPETITION AND RETURNING STRUCTURE	(9)
Loops - while loops, for loops - Nested Loops - Functions - modules - variable scope	
UNIT IV - DATA AND STRING PROCESSING	(9)
Strings - Accessing the Strings - Traversing the Strings - Working with Strings - Formatting Strings	
UNIT V - MUTABLE AND IMMUTABLE TYPES AND METHODS	(9)
Introduction to lists, indexing and slicing of list, del and list methods, Tuples, Dictionary and its methods.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
1. Dr. R. Nageswara Rao, —Core Python Programming, Dreamtech Press, 2017 Edition.	
2. Reema Thareja - Problem Solving and Programming – Python, Oxford University Press, 2nd Edition.	
REFERENCES:	
1. Wesley J. Chun, —Core Python Programming, Pearson Education, 2nd edition, 2010.	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3		3									1		
2	3	3	3	3								2		
3	3	3	3	2							1	1		
4	3	2	2	2							2	3		
5	3	2	2	2							2	1		
CO(W.A)	3	3	3	2							2	2		

M. J. P. N. T. P.

17AGX21 – IRRIGATION WATER QUALITY AND WASTE WATER MANAGEMENT				
		L	T	P
		3	0	0
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to describe		
1.0	To know the basics concepts of irrigation water quality	1.1	the parameters of water quality	
2.0	To impart knowledge on water quality for irrigation purposes, besides relevant environmental	2.1	the concepts of water quality for irrigation	
3.0	To understand the importance of water quality for irrigation and major uses of water and the role environmental issues.	3.1	the water pollution and quality considerations	
4.0	To know the problems and recycle and reuse concepts	4.1	the recycling and reuse of water	
5.0	To impart knowledge on water quality management for irrigation purposes	5.1	the management of water quality	
UNIT I - WATER QUALITY				(9)
Physical and chemical properties of water – Suspended and dissolved solids – EC and pH – major ions –. Water quality investigation – Sampling design - Samplers and automatic samplers – Data collection platforms – Field kits – Water quality data storage, analysis and inference – Software packages				
UNIT II -IRRIGATION WATER QUALITY				(9)
Water quality for irrigation – Salinity and permeability problem – Root zone salinity – Irrigation practices for poor quality water – Saline water irrigation – Future strategies				
UNIT III- WATER POLLUTION				(9)
Sources and Types of pollution – Organic and inorganic pollutants - BOD – DO relationships – impacts on water resources – NPS pollution and its control – Eutrophication control - Water treatment technologies - Constructed wetland.				
UNIT IV - RECYCLING AND REUSE OF WATER				(9)
Multiple uses of water – Reuse of water in agriculture – Low cost waste water treatment technologies - Economic and social dimensions - Packaged treatment units – Reverse osmosis and desalination in water reclamation				
UNIT V- WATER QUALITY MANAGEMENT				(9)
Principles of water quality – Water quality classification – Water quality standards - Water quality indices – TMDL Concepts – Water quality models				
TOTAL (L: 45) = 45 PERIODS				

TEXT BOOKS:

1. . George Tchobanoglous, Franklin Louis Burton, Metcalf & Eddy, H. David Stense, "Waste water Engineering: Treatment and Reuse", McGraw-Hill, 2002.
2. Vladimir Novonty, "Water Quality: Diffuse pollution and watershed Management", 2nd edition, John Wiley & Sons, 2003

REFERENCES :

1. Mackenzie L Davis, David A Cornwell, "Introduction to Environmental Engineering", McGrawHill 2006.
2. Stum, M and Morgan, A., "Aquatic Chemistry", Plenum Publishing company, USA, 1985
3. Lloyd, J.W. and Heathcote, J.A., "Natural inorganic chemistry" in relation to groundwater resources, Oxford University Press, Oxford, 1988

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	3	2	-	-	-	-	2	-	-	-	2	-
2	3	2	3	3	2	-	-	-	-	-	-	-	3	-
3	3	3	3	-	3	-	2	-	-	-	-	-	3	2
4	3	2	2	--	3	-	-	-	-	2	-	-		3
5	3	-	-	-	-	3	-	-	-	-	2	2	3	-
CO (W.A)	3	2	3	3	3	3	2	-	2	2	2	2	3	3



17AGX22 – LANDSCAPE ARCHITECTURE				
		L	T	P
		3	0	0
PREREQUISITE : NIL				
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To understand the paradigms in landscape architecture in the post-industrial revolution era	1.1	Equip the students to do landscape working drawings and preparation of bill of quantities and estimation	
2.0	to understand the multifaceted dimensions of landscape architecture such as ecology, environment and sustainability	2.1	Understand the design solutions for larger sites and express the same using models.	
3.0	To understand the significance of landscape formulations in creating aesthetically pleasing, functional, and sustainable outdoor spaces.	3.1	Understand the different concepts of landscape formulations	
4.0	to understand the fundamental principles of illumination, including light sources, color temperature, intensity, and distribution.	4.1	Acquire the knowledge of illumination and lighting	
5.0	To study the contemporary landscape and the manifestation in the western and Indian contexts.	5.1	Obtain the knowledge on design of water bodies and irrigation systems.	

UNIT I - BASICS OF LANDSCAPE ARCHITECTURE	(9)
Site analysis, synthesis, suitability, landscape zoning and planning with landscape land uses for medium to large scale projects. Evolving an open space structure for the site and suggesting a suitable landscape treatment with respect to ecological, functional, cultural and visual contexts.	
UNIT II - LANDSCAPE FORMULATIONS	(9)
Process for landscape project formulation and landscape design development based on synthesis. Examining how humans occupy exterior space and combines this information with the principles of design to create garden scale models.	
UNIT III- SITE MOBILIZATION	(9)
Site mobilization; Sequence of site activity, site protection measures, site implementation checklist. Design and detailing of hard landscapes: Roads, paving, barriers, edge conditions -functions, types, criteria for selection, design aspects, detail	
UNIT IV - ILLUMINATION	(9)
Outdoor lighting: Definition of technical terms, types of electrical lighting, types of fixtures, auxiliary fixtures. Principles of design for outdoor illumination, design and type of effects with electrical lighting. Safety precautions and drawbacks of electrical lighting, electrical accessories and their installation. Solar energy and lighting.	

UNIT V- IRRIGATION FEATURES	(9)
Water features and Irrigation systems: Design of water features such as swimming pools, cascades, fountains etc., and their technical requirements. Consideration for design and detail of water bodies and natural ponds. Design of irrigation system – landscape area types, Course Overviews and design, water needs and sources, application, methods of installation. Control systems, scheduling and maintenance	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:
<ol style="list-style-type: none"> 1. Simonds. J. O. 1961. Landscape Architecture: The Shaping of Man's Natural Environment. F.W. Dodge Cooperation, London Harris.C.W. and Din, N.T. 1997. Time Saver Standards For Landscape Architecture. Mcgraw – Hill International Edition, Arch. Series 2. Starke .B. and Simonds, J. O. 2013. Landscape Architecture: A Manual of Site Planning and Design. 5th edition. McGraw-Hill Professional.
REFERENCES :
<ol style="list-style-type: none"> 1. Shaheer, M., Dua, G.W. and Pal, A.2012. Landscape Architecture in India: A Reader. Indian Journal of Landscape Architecture. 2. Reid, G. W. 1993. From Concept to Form: In Landscape Design. John Wiley & Sons.

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	3	2	-	-	-	-	2	-	-	-	2	-
2	3	2	3	3	2	-	-	-	-	-	-	-	3	-
3	3	3	3	-	3	-	2	-	-	-	-	-	3	2
4	3	2	2	-	3	-	-	-	-	2	-	-	-	3
5	3	-	-	--	-	3	-	-	-	-	2	2	3	-
CO (W.A)	3	2	3	3	3	3	2	-	2	2	2	2	3	3

Dr. A. Narayan Reddy

17AGX23 - INTEGRATED FARMING SYSTEM				
		L	T	P
		3	0	0
PREREQUISITE : NIL		QUESTION PATTERN :		
COURSE OBJECTIVES AND OUTCOMES:				
Course Objectives		Course Outcomes: The Student will be able to		
1.0	To gain a practical understanding of different specialized farming systems, including their unique characteristics, techniques, and management practices.	1.1	Understand practical knowledge on specialized in different farming system.	
2.0	to apply recycling methods for the utilization of farm waste in Integrated Farming System (IFS) components, considering the principles of sustainability and resource efficiency.	2.1	Apply the farm wastes with recycle use of different IFS components.	
3.0	To conduct a comparative analysis to evaluate the benefits of different IFS components in terms of productivity, profitability, environmental impact, and social aspects.	3.1	Analysis of comparative benefits of the different IFS components	
4.0	to design a farming system model that integrates wetland, garden land, and dry land components, considering their specific requirements, synergies, and potential for sustainable resource utilization.	4.1	Design a farming system model for wetland, garden land and dry land	
5.0	To evaluate the extent and effectiveness of the Integrated Farming System (IFS) in wetland, garden land, and dry land areas.	5.1	Evaluate the extent of wetland, garden land and dry land Integrated Farming System	

UNIT I INTRODUCTION OF FARMING SYSTEM	(9)
Farming system – introduction – scope of farming system – importance – concept – principles of farming system - Types of farming systems – Advantages and limitations - suitability – factors affecting the farming system	
UNIT II INTEGRATED FARMING SYSTEM	(9)
Integrated farming system-historical background - objectives and characteristics advantages of IFS – Components of IFS - Integrated Farming System in Wetland – IFS in garden land – IFS in dryland and fallow land	
UNIT III- LIVESTOCK PRODUCTION IN IFS	(9)
IFS With Goats and Sheep – housing and feeding management – deworming – Young stock management - Dairy Farming in IFS - Fodder production in IFS - IFS With poultry rearing - Duck farming – Rabbit farming – Piggery	

UNIT IV - IFS COMPONENTS	(9)
Agroforestry – definition – types of agroforestry system – benefits of agroforestry system– Aquaculture – Fish cum agriculture and horticulture – Beekeeping – types and cast of bees – care and management in beekeeping – Sericulture - Mulberry cultivation – Silkworm rearing – Organic farming – Azolla – Small scale nursery.	
UNIT V- RESOURCE RECYCLING IN IFS	(9)
Resource recycling in wetland IFS - Resource flow in crop , dairy , biogas , spawn ,silviculture In IFS - Biogas production through IFS – Resource recycling in crop + goat IFS - Uses and features of biogas - Structure and function of Dheenabandhu Gas plant - Vermicompost - Preparation of vermicompost from farm residue – Mushroom production in IFS.	
TOTAL (L: 45) = 45 PERIODS	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. . Nanda, Sankarsana. Integrated farming system practices: challenges and opportunities. New India Publishing Agency, 2016 2. Ravikiran Vasant Mane, Integrated Farming System: A Strategy for Sustainable Farm Production & Livelihood Security, Scitus Academics, 2016 	
REFERENCES :	
<ol style="list-style-type: none"> 1. EFERENCES 1. Zaman, Integrated Farming System and Agricultural, New India Publishing Agency, 2019 2. . Nanwal R. K. Farming System and Sustainable Agriculture, Kalyani Publishers, 2017. 	

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	2	3	3	3	2	2	-	-	-	-	1	2	-
2	2	2	2	2	3	-	3	3	-	-	-	1	3	2
3	3	3	3	-	3	-	-	3	-	3	-	2	-	-
4	2	2	2	2	3	-	-	-	3	3	3	2	3	-
5	3	3	3	3	3	-	-	-	-	-	3	2	-	3
CO (W.A)	2	2	3	3	3	2	3	3	3	3	3	2	3	3

Dr. N. K. S. Reddy

17AGX24 - IT IN AGRICULTURAL ENGINEERING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN :			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives			Course Outcomes: The Student will be able to		
1.0	To introduce the students to areas of agricultural systems in which IT and computers play a major role.	1.1	Understand the applications of IT in remote sensing applications such as Drones etc..		
2.0	To expose the students to IT applications in precision farming, environmental control systems, agricultural systems management and weather prediction models	2.1	Get a clear understanding of how a greenhouse can be automated and its advantages		
3.0	To understand IT principles and concepts to effectively manage field operations in agriculture, including data collection, analysis, decision-making.	3.1	Apply IT principles and concepts for management of field operations		
4.0	To Acquire knowledge about weather models, their input data sources, and their applications in agriculture, including crop management, irrigation scheduling, pest and disease control, and risk assessment.	4.1	Get an understanding about weather models, their inputs and applications		
5.0	To Understand the role of IT in e-governance in agriculture, including the use of information systems, digital platforms, and online services.	5.1	Get an understanding of how IT can be used for e-governance in agriculture.		

UNIT I PRECISION FARMING	(9)
Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.	
UNIT II ENVIRONMENT CONTROL SYSTEMS	(9)
Artificial light systems, management of crop growth in greenhouses, simulation of CO2 consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.	
UNIT III- AGRICULTURAL SYSTEMS MANAGEMENT	(9)
Agricultural systems - managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources, Linear programming, Project scheduling, Artificial intelligence and decision support systems.	

UNIT IV - WEATHER PREDICTION MODELS	(9)
Importance of climate variability and seasonal forecasting, Understanding and predicting world's climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying seasonal climate forecasts.	
UNIT V- E-GOVERNANCE IN AGRICULTURAL SYSTEMS	(9)
Expert systems, decision support systems, Agricultural and biological databases, e-commerce, ebusiness systems & applications, Technology enhanced learning systems and solutions, elearning, Rural development and information society.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:
<ol style="list-style-type: none"> 1. National Research Council, "Precision Agriculture in the 21st Century", National Academies Press, Canada, 1997. 2. H. Krug, Liebig, H.P. "International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation", 1989.
REFERENCES :
<ol style="list-style-type: none"> 1. Peart, R.M., and Shoup, W. D., "Agricultural Systems Management", Marcel Dekker, New York, 2004. 2. Hammer, G.L., Nicholls, N., and Mitchell, C., "Applications of Seasonal Climate", Springer, Germany, 2000

COURSE OUTCOMES	PROGRAMME OUTCOMES												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	1	2	3	3	2	2	2	-	-	-	-	1	2	-
2	2	2	2	2	2	3	3	-	-	-	-	1	3	3
3	3	3	3	-	3	-	3	-	-	-	-	2	-	3
4	2	3	2	2	2	-	-	-	-	-	3	2	3	-
5	3	3	3	3	3	-	-	-	-	-	3	2	-	3
CO (W.A)	2	3	3	3	2	3	3	-	-	-	3	2	3	3

Signature